

# THE PSYCHOLOGICAL REVIEW

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## IN MEMORY OF WILHELM WUNDT

BY HIS AMERICAN STUDENTS

At a meeting of the University of Iowa Philosophical Club held October 19, 1920, a symposium on the philosophical and psychological contributions of Professor Wundt furnished the program. Reports on Wundt's philosophical and ethical studies were given by Professor G. T. W. Patrick, a former student, and Professor Edwin Starbuck. Dean C. E. Seashore, who also knew Wundt personally, discussed his psychology, Dr. Lorle I. Stecher outlined his publications, and the writer, who is president of the club, supplemented his own reminiscences of the psychology work at Leipzig in 1906 with a series of letters from a number of Wundt's distinguished students in psychology.

At the annual meeting of the American Psychological Association in Chicago, December 1920, a commemorative exercise in honor of Wilhelm Wundt followed the president's address on the evening of the 29th. Reminiscences of Wundt were given by Professors J. McK. Cattell, C. H. Judd, W. D. Scott, and R. Pintner.

The following papers include the letters read at the Iowa meeting, together with the more extended contributions of Cattell and Judd read at Chicago, and reminiscences from other students of Wundt furnished at the suggestion of the PSYCHOLOGICAL REVIEW. It seems appropriate to publish these tributes by Wundt's American students in a collected form at this time.

A great teacher is known best by the type of trained students who leave his laboratories and carry further his principles to finer determinations and more subtle and more

useful applications. No teacher in psychology has had more distinguished students from many countries than Professor Wundt; and in America, where experimental psychology has made greatest advances during the last three decades, many of the great leaders were students at Leipzig for short or long periods during Wundt's creative directorship.

The first two young men to work at Leipzig and later to found psychological laboratories in this country were President G. Stanley Hall and Professor J. McK. Cattell, the former being a student in 1879-80 and the latter in 1880-82 and 1883-86. Dr. Hall founded the laboratory at Johns Hopkins in 1883 and Professor Cattell the laboratory at Pennsylvania in 1887. Many of Wundt's other American students either founded laboratories on their return from Germany or played a leading part in the development of the experimental laboratories in America.

The following contributions are arranged chronologically according to the date at which the writers were connected with the Leipzig laboratory. The key-note of the symposium is Wundt's personality. No attempt is made to appraise the value of his scientific work; that remains for the future to determine. In the foreground we see Wilhelm Wundt, the man and the teacher, revered by his pupils and inspiring them with zeal for exact and honest scientific research.

B. T. B.

# I

I think I was the first American student to work in Wundt's laboratory. It was in its early days—I think about 1878 or 1879—and I only served as subject, for I gave all my time during the two years I was there to work in Physiology with Ludwig. There was then an impression that Wundt was not very scientific, and there were rumors that Helmholtz had found him too inexact as his assistant. One group, I remember, thought Horwicz should have been elected to Wundt's chair. Wundt was very rarely seen in his laboratory, and impressed me as rather inept in the use of his hands. Most of his time was spent in preparing his amazingly clear and popular lectures, which were always crowded. I attended

his seminary, the method of which in my time was to have every member read and carefully epitomize books, articles, etc., assigned by Wundt, he himself, as I remember, taking notes incessantly. I felt that our business as members of the seminary was chiefly to read for him, and I think this contributed much to the impression of the great erudition which characterizes his works.

Save his doctrine of apperception, it does not seem to me that he made any epoch-making contributions to psychology although he will always fill a large place as the first to establish this science on an experimental basis. He was a wonderful compiler and digester, and I have always felt that his *Völkerpsychologie* was really quite as important and involved quite as much commendable labor on his part as did the *Physiologische Psychologie*.

He was a very able and effective controversialist, but it always seemed to me that he was short-sighted and partisan in antagonizing the new introspective movement started by his own pupils, as Freud has been in antagonizing Adler and the Zurich school. Both tried to devour their own children. This antagonism seemed to me an illustration in the scholastic field of the spirit of the old German feudal overlord.

I have always felt, too, that if Wundt had been half as much of a biologist as he was a physiologist he would have given our science a broader basis, and also that he was too prone to ignore the contributions of psychiatry.

Nevertheless, he did a remarkable and epoch-making work, and I for one feel no less debt of gratitude to him as a psychologist even though he bitterly denounced the Allies in a narrow and almost bigoted way and was one of the ninety-odd signers of the notorious Manifesto.

G. STANLEY HALL

## II

Forty years ago I studied in Göttingen and in Leipzig, hearing the lectures given by Lotze and by Wundt. It seems odd, as I look back on it, that I made no effort to become acquainted with either of these great men. They seemed elevated far above the twenty-year-old student, who at their lectures wrote 'als dictirt euch der Heilig Geist.'

My first personal meeting with Wilhelm Wundt was in his conversation room in the autumn of 1883. A notice had been posted appointing a conference with those who wished to join his seminar for research, and there appeared six or seven of us, representing almost as many nationalities. Stanley Hall had been there a year or two before, but worked mainly with Ludwig and served only as Versuchstier in the newly established laboratory of psychology. We were followed by other Americans in large numbers; eighteen of the fifty psychologists selected in my study of 1905 had worked at Leipzig and there were many more; now our students and our students' students, even to the third and fourth generations, trace their descent from the Leipzig laboratory.

In one of his recently published letters, William James wrote to Karl Stumpf of Wundt: "Was there ever since Christian Wolff's time such a model of the German professor?" This more formal and official side was shown in our first conference, for he had in his hand a memorandum containing a list of subjects for research and taking us in the order in which we stood—there was no question of our being seated—assigned the topics and hours to us by a one-to-one correspondence. As a large part of the work of the laboratory was then on reaction-time experiments, it is not surprising that such a subject fell to my lot, and it was fortunate, for I had already in America begun experimental work on the time of sensori-motor processes. Wundt, however, was mainly interested in experiment for the aid it gave to introspection, and the subject assigned to me was to react as soon as I saw a light and in a second series to react as soon as I recognized its color, with a view to analyzing the factors of apperception. This I could not do, and in my second interview with Wundt I presented an outline of the work I wanted to undertake, which was the objective measurement of the time of reactions with special reference to individual differences. Wundt said that it was "*ganz Amerikanisch*"; that only psychologists could be the subjects in psychological experiments. I later bought and made the apparatus needed and did the work in my own room, without, however, any interruption in relations that were then becoming friendly.



My last interview as a student with Wundt was at my doctorate examination when the sympathy and kindness that great men usually have, but are often too shy to show, were much in evidence. In accordance with the pernicious method copied into our universities, the candidate was examined in three subjects, psychology being then only a part of philosophy. I had some knowledge of mathematics, physics, physiology and zoölogy as related to my own work, but not much besides. I began to attend Klein's lectures on mathematics, but found them hopeless. Finally I selected physics and zoölogy, and Wundt was most anxious that I should get through. He explained that Hankel was mainly interested in the refraction of light by crystals, and Leuckhart in parasites, and that I should read their papers on these subjects and lead up to them if I could. In the examination before the faculty, Wundt asked me things that I was sure to know and then to make it plausible a couple of questions that no one but a German professor of philosophy could possibly know. During the rest of the examination he was even more nervous than the candidate.

Personal reminiscences are wanted, so I may relate two or three incidents that are more or less characteristic. Wundt was asked for an introduction to Stumpf, next to him the leading German psychologist, then at Halle only twenty miles from Leipzig. He said that he was sorry that he could not give it; he was not personally acquainted with Stumpf; it was better so, for there might be scientific subjects on which they would differ and then each could speak more freely. This did happen later, and each did tell the truth as he saw it without violating the courtesy that personal acquaintance might from their point of view have required. In like manner with characteristic kindness, perhaps to me as well as to her, he admitted an unusually intelligent American girl to his lectures on psychology at a time when this was a rare privilege in a German university. There were two or three hundred German students in attendance, probably the most stupid ones in the university, for they were mostly theologues, for whom the course was compulsory.

Wundt a little later said: "I am sorry that I admitted Miss X to the lectures; it quite troubles me; I feel always that I ought to speak in a way that a woman can understand." This I submit, while reminiscent of the Kaiser's three K's, betrayed true knightliness in the old style.

In one respect Wundt was modern and American. He had injured his eyesight by experiments on vision and was much interested in a typewriter that I took with me to Germany when such a thing was almost unknown there. So I got one for him, and thereafter he did all his composition on it. I am told that Avenarius said it was an evil gift, for with it Wundt wrote twice as many books as would otherwise have been possible. Apart from the typewriter, Wundt lived remote from the rough ways of democracy. The idea of visiting the United States, when I urged it, or even of going to England, rather frightened him. But, while there was a certain narrowness in the life of the German university professor of fifty years ago, the provincialism was that of a true intellectual and social aristocracy. With them the family life is nearly always simple and fine; it was surely so in the apartment at Leipzig, to which it was my privilege to be admitted, formally at first, and then more intimately, as on leisurely walks on Sunday afternoons and at Christmas Eve ceremonies, when only Mrs. Wundt, a woman of rare charm, and the two little children were there.

Wundt was somewhat disturbed that I became acquainted at Leipzig with Wilhelm Liebknecht, the leader of German socialism, but with characteristic consideration he wrote to me some years later that I should be interested to hear that in the gymnasium his son Max and Liebknecht's son Karl were inseparable friends. Max Wundt has become professor of classical archeology; Karl Liebknecht, almost alone in the Reichstag, opposed war in 1914, as his father did in 1870; then at the hour of mingled defeat and victory he laid his life on the altar of the God whom he served.

Wilhelm Wundt too is dead. The London *Times* and other journals have impertinently remarked that he would

have been more honored if he had died before signing the manifesto of the ninety-three German professors—that rather absurd, but truly pathetic and noble appeal to the good-will of the world. The civilization for which those men stood ranks in its fine distinction with the best periods of Greece, Italy, France and England. It is now submerged in blood and ashes, sunk under the weight of its virtues and its sins, of the specious idealism and crude materialism of its overlords, its allies and its enemies. Let us hope that the brute arbitrament of force may once more yield to the generous rivalry of science and of diverse civilizations, and not hope only, but do our part to repay the debt that we owe to the dead.

These remarks are by order limited to personal reminiscences and to ten minutes. Wundt's leadership in laying the foundations of psychology, his vast contributions to nearly the whole range of the philosophical disciplines, are not here under consideration. The fact that his work for psychology was begun sixty years ago proclaims its fundamental character and accounts for its limitations. We advance over the temporary bridges built by men such as he, and they are more nearly works of genius than are the rubble and cement with which we may later replace them. Wundt was before all a scholar, absorbed in his scholarship; with that complete detachment from the here and now and the narrower self that often characterizes the hereditary noble and the true scholar.

This is our master, famous, calm and dead. . . .  
Leave him—still loftier than the world suspects,  
Living and dying.

J. McKEEN CATTELL

### III

It was in the autumn of 1889, that I entered the University of Leipzig and became acquainted with Professor Wundt. My knowledge of German was meagre; and I had serious misgivings as to my first interview with the Herr Geheimrath. He reassured me at once, however, by saying that though he spoke no English, he understood it and would be glad to have me use my own language.

On learning that I had been a student in Rome, he remarked: "Why then, you are familiar with the philosophy of St. Thomas"; and in the course of the conversation he showed that he was thoroughly informed in regard to the neo-Scholastic movement inaugurated by Pope Leo XIII.

At this meeting also, noticing that I had a copy of the *Verzeichniss der Vorlesungen*, he suggested that the list of courses was attractive and that, like other students, I would probably be tempted to register for a large number of subjects. "Do not attempt too much," he said; "this is the best advice I can give you."

Wundt impressed me as a man who sought earnestly for the truth. With a wide range of knowledge he combined an accuracy, even a severity, of thought, the result of his scientific training. While he adopted the latest methods of research and in one field at least did the work of a pioneer, he appreciated the achievements of the past and gave full credit to his contemporaries who so often took a different point of view.

His lecture hall, with sittings for some three hundred students, was always well filled. It was a cosmopolitan audience which reminded me, in some respects, of the Urban Collège in Rome. Punctuality was one of the professor's virtues and it had the desired effect upon his auditors. Whatever the subject—and he covered the whole ground of the philosophical and psychological sciences—his hearers were sure of an interesting lecture. It was delivered with earnestness and fluency. Wundt always laid upon the rostrum a notebook; and then forgot that it was there. Some of the students knew that his vision was defective; and for that reason they formed a higher estimate of the man's energy and erudition.

The psychological laboratory, in that day, was primitive enough. It occupied a half dozen rooms in the old building which has since disappeared. There was no great show of apparatus; but such as it was, it was nearly all in daily use. Additions to it were, for the most part, of Wundt's own devising. Of the men who worked there, at least two-thirds

were Americans. Some have become leaders in psychology and have made known the principles and methods of the Leipzig school to students in various universities of our country.

Usually, the Professor met the research students in the laboratory after his lecture. Those were moments of free-and-easy intercourse. They gave an opportunity to get advice concerning problems under investigation, to discuss new publications or to secure an expression regarding the statements which came from various quarters with reference to the findings of the Leipzig laboratory.

For the acrimonious, Wundt had little use. He could take part in a discussion quite vigorously; but he preferred to conduct it on a high level. If, in his lectures, he adverted to those who differed from him, there was no trace of narrowness in his criticism. On the contrary, I recall that he deprecated the temper of an ardent writer who, in coming to the defense of the Leipzig Institute, had been rather severe upon the author of the attack.

There was a certain intensity about Professor Wundt, due no doubt to the fact that he saw continually wider and wider horizons opening before him. It seemed at one time as though his absorption in speculative problems had drawn him too far from scientific interests. Probably he thought that the 'System der Philosophie' was the necessary culmination of his scientific labors. In point of fact, his enthusiasm for psychology had not cooled, as is evident from his later publications.

Wundt's habits were of the simpler sort. There was no ostentation about him. I think that he was gratified to have students from all parts of the world coming to his lectures, and still more to see his disciples filling chairs both in Germany and beyond its borders. But his success did not make him less approachable. He went on his accustomed way, patient and laborious, and always ready to help others out of the fulness of his own knowledge.

To see him, half an hour before his lecture, passing along the Promenade, no one would have suspected that he was among

the foremost thinkers of his day. Few, even of the students, recognized him. He was not followed by a 'Shadow of Providence'; and yet, as he went along, one thought, quite naturally, of a street in Königsberg.

EDW. A. PACE

#### IV

The paragraphs printed below are from a letter written in 1890 immediately after my first hearing of a lecture by Wundt. The impression of triangularity to which I refer is excellently brought out in the portrait by Dora Arnd-Raschid (published by the Berlin *Photographische Gesellschaft*); it is less obvious in the Perscheid photograph of 1904.

"The *famulus* swung the door open, and Wundt came in. All in black, of course, from boots to necktie; a spare, narrow-shouldered figure, stooping a little from the hips; he gave the impression of height, though I doubt if in fact he stands more than 5 ft. 9.

"He clattered—there is no other word for it—up the side-aisle and up the steps of the platform: slam bang, slam bang, as if his soles were made of wood. There was something positively undignified to me about this stamping clatter, but nobody seemed to notice it.

"He came to the platform, and I could get a good view of him. Hair iron-grey, and a fair amount of it, except on the top of the head,—which was carefully covered by long wisps drawn up from the side. Forehead not high, but very broad and swelling at the temples. Eyes dark behind rather small-glassed spectacles, very good: honest, friendly, alert; but there is something sadly wrong with the muscles of the right. Nose, as the passports say, ordinary; depressed at the bridge, but rising below to a serviceably sized organ. Mouth covered by a heavy drooping moustache, and chin by a shortish square-cut beard, iron-grey like the hair. The general impression, in spite of the bluntish beard, was of an inverted triangle: the head must be tremendously broad at the temples, for there is no hint of any weak pointing of the chin.

"The platform has a long desk, I suppose for demonstrations, and on that an adjustable book-rest. Wundt made a couple of mannered movements,—snatched his forefinger across his forehead, arranged his chalk,—and then faced his audience with both elbows set on this rest. A curious attitude, which favours the impression of height. He began his lecture in a high-pitched, weak, almost apologetic voice; but after a sentence or two, during which the room settled down to silence, his full lecturing voice came out, and was maintained to the end of the hour. It is an easy and abundant bass, somewhat toneless, at times a little barking; but it carries well, and there is a certain persuasiveness, a sort of fervour, in the delivery that holds your interest and prevents any feeling of monotony. A good sort of voice, I should think, for a lecturer whom one has to listen to month in and month out. The lecture was given without reference to notes; Wundt, so far as I could tell, never looked down once at the book-rest, though he had some little shuffle of papers there between his elbows.

"I told you that the attitude struck me as curious. So was the play of hands and forearms all through the lecture. Wundt did not keep his arms lying on the rest: the elbows were fixed, but the arms and hands were perpetually coming up, pointing and waving. You might think that this movement would be embarrassing, even distressing, to watch; but it wasn't; I had the fanciful impression that Wundt was using his hands where the ordinary lecturer turns his head and eyes; the movements were subdued, and seemed in some mysterious way to be illustrative. Very characteristic, anyhow, the rigid body and the almost as rigid head, and these hands playing back and forth between the voice and the audience.

"He stopped punctually at the stroke of the clock, and clattered out, stooping a little, as he had clattered in. If it wasn't for this absurd clatter I should have nothing but admiration for the whole proceeding."

E. B. TITCHENER



## V

I had come back to Leipzig in the fall of '91 and got my first glimpse of Wundt as he was going up the stairs to his lecture room in the new university building. And the sight was anything but reassuring to one who had been moved to return to his 'alma norverca' through a feeling of academic piety focussed mainly around the person of the "chief".

Wundt was toiling feebly and slowly up the ascent, to all appearance hardly able to cope with the weight of a huge overcoat which hung loosely around him, and it was with the misgiving that I was destined to hear merely fragments of a lecture delivered by a broken old man that I entered the lecture room.

But all misgivings vanished when I 'apperceived' the hall: it was the largest lecture-room in the university and crowded to the limit of its capacity. During the lecture my neighbor volunteered the information that there was no lecture-room in the university large enough to hold the audience that 'subscribed' to the lectures on psychology. Assuredly the setting betokened no lack of power in the lectures and assuredly there was no trace of senility in the lecturer. It was the old Wundt of 1890—the clear enunciation, the well-rounded sentences, the dignified utterance, the occasional gesture with the loosely clenched hand—hardly a fist—the respectful reference to his charts—it only needed the bisyllabic pronunciation of 'Jon' Locke's surname to make one feel that no change had taken place in the Wundt of a former decade.

I cannot say that the social side of one's intercourse with Wundt, as expressed in the bounteous dinners which he gave from time to time to the 'Fortgeschrittene' and laboratory assistants, very much furthered a 'man to man' acquaintanceship between teacher and students, and this perhaps less through Wundt's attitude than through that of the German contingent among the guests. For their attitude seemed to be that of men questioning an oracle, and when the oracular answer came, questioning or discussion ceased. It must be said also that in this situation the oracle was rarely dumb or

ambiguous. Nevertheless when some untamed transatlantic neophyte blurted out an objection to an oracular response or applied some hardy paradox to it, I had the impression that Wundt actually welcomed what the pious considered an interruption—manifesting the welcomeness by a smile which had in it nothing superior or condescending.

To the much bandied reproach of Wundt's intolerance of views that did not agree with his own, my three years' experience in the Leipzig Institute gives not the slightest support, though this does not say that it was easy to convince him of defects in some course of laboratory practice fathered by him but which, in the ordeal of a new investigation, had been found wanting. In my "Arbeit" I had run counter to some of the Wundtian doctrines and in particular had girded against his law of relativity as explanatory of Weber's Law. To this he made no demurrer nor discussed the point, but simply asked me what was my main objection to the 'Gesetz der Relativität' and then passed on to a new topic. Parenthetically it may be said that when I started in to discuss my Arbeit with Wundt I felt that I knew more about the limited domain which I had been exploring than anyone, including Wundt—a state of mind probably not infrequent with burgeoning doctors—but before the interview was over I felt that Wundt knew more about the subject both in itself and in its relations than was either right or proper for any one person to know. The interview was of the nature of a revelation to me.

The popular belief that a great philosophic mind is more at home when dealing with abstractions than with ideas of concrete objects finds documentary support from one of the tables in an early edition of the 'Physiologische Psychologie', where one may see that while it took Wundt appreciably longer to react logically to words denoting concrete objects than was the case with his co-workers, when it came to reactions to far-reaching abstractions his record was almost absurdly short.

But Wundt's immersion in the depths of philosophic thought had not washed out of him a capacity either for warm emotions or for deep emotions. Misuse of laboratory apparatus was sure to arouse in him indignation which was

not slow to find vent in winged words, and I have seen him white and trembling with anger when some of his 'Zuhörer,' bent on hearing a Wagnerian overture, slipped out of a lecture on philosophy shortly before its close.

But a far deeper and more complex emotion than anger overcame him when the 'Festschrift' closing the series of the *Philosophische Studien* was presented to him on his seventieth birthday.

We had journeyed up to the little village in the Thuringian Forest where Wundt, as was his wont, was passing a part of the summer holidays—Külpe, Kraepelin, Meumann, Lange, Kirschmann—I do not recall the names of all—and when Wundt was brought in before this little gathering of men who had been his laboratory assistants, some of whom he had not seen for a decade and some not since the earliest days of the *Studien*, he broke down completely and for some minutes the ready speaker and accomplished orator was unable to utter a word. And when the 'Festschrift' was handed to him by Külpe who spoke with great sweetness and with reverential dignity, again the old man was hardly able to speak.

That was the last time I saw Wundt and I felt then as I felt in my student days that I had come into the presence of a great man. For depth and range of learning, for capacity for generalization, for power of scientific imagination, he was the ablest man I ever met.

FRANK ANGELL

## VI

The foremost service of Wilhelm Wundt to psychology was the foundation of laboratory investigation. Before his time experimental research in psychology had been mainly individual. Weber and Fechner had experimented privately—apart from their university work. Wundt secured the recognition of his laboratory as a university institution, with rooms in one of the university buildings. He gathered around him an enthusiastic group of students and assistants, whom he trained in the methods of exact experimentation, and he selected their research problems in such a way as to cover every part of the field.

The tremendous interest in experimental psychology which suddenly developed—the spread of research in Europe and America during the '90's—is due in large part to the example of the Leipzig laboratory and the efforts of Wundt's pupils.

As soon as the Leipzig laboratory was fairly launched, in 1883, Wundt started a magazine, the *Philosophische Studien*, which was devoted to the publication of research papers. The earlier volumes contain many notable articles by men whose names have since become well known in the psychological world. Cattell, founder of the laboratories at Pennsylvania and Columbia; Scripture, who started the laboratory at Yale, were among Wundt's earlier pupils. Stanley Hall, who opened laboratories at Hopkins and Clark, was an observer of Wundt's work during his stay at Leipzig. These men belong to the '80's. In the early '90's Frank Angell, Pace, Titchener, and Witmer were my fellow-students there. These, and others who have since fallen by the wayside, are responsible for the scores of laboratories which suddenly sprang into being in America and soon outstripped the German laboratories in productivity.

At the period I speak of there were students from Russia, Norway, and Rumania working under Wundt, who spread the movement in their own countries. Of the Germans, Kiesow was called to Italy, Meumann to Switzerland, Kirschmann to Canada. Külpe and others carried the spirit of Wundt's laboratory to other German universities. I speak only of my own time. The same influence continued till the outbreak of the war.

I would not in the least undervalue the personal contributions of other German investigators—of men like G. E. Müller, Ebbinghaus, Münsterberg, and Stumpf. As individuals these perhaps obtained more important original results. But Wundt, working through his pupils and directing their lines of research, far outstripped them all. An examination of his 'Grundzüge,' that great compendium of psychological results, is sufficient to prove this.

Apart from specific additions to our psychological knowl-

edge, the Leipzig laboratory was largely instrumental in imbuing psychological investigators with the spirit of *exactness* and *thoroughness* in research. And it was responsible for many of the standard pieces of apparatus with which our laboratories are equipped. All these are part of the same general development—the research laboratory for human psychology. Wundt's first claim to the homage of psychologists is that he is the father of laboratory psychology.

The value of Wundt's contributions to psychological principles may be challenged. Some of his most notable theories have already been discarded. His doctrines of innervation feelings, of apperception, of chromatic and achromatic vision, of tonal relations have been superseded. But his conception of psychological experimentation prevails today as strongly as ever, and seems likely to govern future work for many years to come.

Speaking of Wundt as a man, what impressed me most was his vast, encyclopedic knowledge. His lectures covered the entire field of psychology and philosophy. Animal psychology and folk psychology were among the courses which he offered, as well as logic, ethics, and history of philosophy. His 'Völkerpsychologie' contains a wealth of material; one marvels at his being able to carry this work through to completion at the age of 70.

One of my pleasantest memories of Leipzig days is a lecture on English philosophy in which Wundt frequently referred to 'Schon Locker.' It was some time before I identified this personage as John Locke.

In appearance Wundt was impressive. He was tall, rather slender, and dignified in his movements and conversation. He invariably wore a black frock coat. On the street his majestic bearing was somewhat marred by a most disreputable soft hat which he always wore. It was apparently a relic of his student days. I can only conjecture that it was retained in virtue of some solemn vow or sentiment.

In conversation he was affable, though somewhat formal. One felt that he was the master. No one of his students would have ventured a joke or an off-hand remark in his

presence. He dealt with his flock somewhat autocratically, and prescribed the lines and methods of research rather too minutely. It was characteristic that he never attended congresses or meetings in which he would have met his colleagues on a footing of equality. Yet I never thought of him as objectionably dogmatic, like many other German professors. He was conscious of his leadership. That was all.

I worked in Wundt's laboratory in 1891-92. Fifteen years later, in 1907, I was passing through Leipzig and called on him at the fine laboratory which had supplanted the dingy rooms in the old 'Convict-gebäude.' The janitor took my card and Wundt received me immediately. To my surprise he recalled without hesitation the year I had worked under him and mentioned by name the other Americans who were there at the same time. Remember that every year he had a large number of students, that I had done no special research in his laboratory, that he was over 75 at the time. Is it to be wondered that I was dumfounded at this remarkable exhibition of memory?

In closing let me bear personal testimony to Wundt's influence on the scientific attitude of his students. The exact methods which he insisted upon could not fail to impress those who worked under him and mold their own conception of research. Coming to him as I did from an atmosphere of philosophical speculation, the spirit of his laboratory was a God-send. I owe much to Wilhelm Wundt for the change he wrought in my life ideals. I am glad of this opportunity to pay tribute to him as teacher and example.

HOWARD C. WARREN

## VII

I fear I can make no significant contribution to your memorial meeting for Wundt, of whose death I had not heard. I suppose, in common with all others who know the facts, I have considered him, while not the founder, as nevertheless by far the most important prophet of experimental psychology. Not only in the establishment of the

Institute, but in his own continued productivity and in the stimulation of others he has no serious rival.

This is not the time to attempt a critical estimate of his work. Suffice it to say that I place a very different estimate upon its different portions, and regard the work in experimental psychology as altogether the most significant, and as likely to have by far the most lasting value.

JAMES R. ANGELL

### VIII

Wundt's greatest contribution to Psychology will, in my judgment, be not some particular doctrine or experimental discovery, but the impetus which he gave to the entire experimental activity in our field. It is largely due to him that Psychology is taking its place among the important sciences.

But in saying this, one may well appreciate the stimulus which has come from particular doctrines of his, such as his teaching that feelings change in three aspects or dimensions, even though the doctrine itself hardly seems destined to be regarded as true in itself. And one can see that his influence has counted strongly and with great benefit to correct the disproportionate attention given to sensory and cognitive processes, by elevating into importance those processes directly involved in emotion and in volition. Much weight, I feel, should be given to his doctrine in regard to Psychic Causality.

Anyone who worked in his laboratory will remember the interest he took in his students, and the intellectual and scientific stimulus which came from the man. His daily round of the laboratory was looked forward to by his experimenters, and I know of those who were careful that their daily programme should be so arranged that they should always have the benefit of this visit of his. His geniality at his home, and particularly the conversations after his Sunday dinners, are among the most valued of my recollections of him.

GEORGE M. STRATTON



## IX

I studied with Wundt during the spring and summer semester of the year 1894, taking lectures and doing some work in the laboratory. Wundt's quarters were then in the old buildings on the Grimmaische Steinweg, if I remember rightly. Külpe was there then and I worked with Kiesow in the laboratory. Wundt was giving a general systematic course in psychology, which I attended.

When this symposium was proposed I was interested in resuscitating my old note-book with its flexible, black cover and its little blue-margined label saying, 'Wundt—Psychology.' My notes contain diagrams of apparatus and figures which have since become so familiar,—the rotating discs for mixing colors, the tuning forks and resonators, tachistoscope, etc. This and lots of other apparatus Wundt had on a long table on the platform in the lecture room and illustrated his lecture with it. This, of course, was his great innovation. He was a very clear and interesting speaker, easy to understand and easy to follow, even for a foreigner not too well acquainted with the German. I seem to remember that he was very fond of the word 'wahrscheinlich,' which he drew out in a peculiar manner, and the phrase 'psychische Vorgänge,' is suggested to me when I visualize Wundt on the lecture platform. He was always talking of Vorgänge, Ereignisse, Prozessen and Geschehen, as applied to mental life, which of course indicates his point of view, new then but now familiar. "Vorstellungen sind Vorgänge und nicht Gegenstände. Sie sind Ereignisse," as it says in my notes.

An idea, he said, can never come again; it is a new one, just as a Bewegung can never come twice. So as *elements* Vorstellungen will not serve. These old errors I suppose were what he had in mind when he said in an early lecture as reported in my notes, 'Man muss vergessen alles was er weiss wenn man ein Psycholog werden will.'

Socially Wundt was very kind and friendly. My sister was then studying in Leipzig, and Wundt invited us to dinner at his home and after the dinner we returned to the drawing room and stood around in a circle and said 'Mahlzeit' and

shook hands. I returned to Leipzig in 1897 and heard one lecture by Wundt in his fine lecture room in the new building. There was the usual large and attentive and respectful audience

In later years my interest has been more in Wundt as a philosopher than as a psychologist. Whether he devoted himself to psychology, philosophy, logic, ethics, social psychology, the psychology of language, or even the philosophy of nature, the same masterly hand was shown. This was the wonder of the man. Whether it was the power of his memory or his patient application that wrought all this body of learning I do not know, but his many books display a wonderful encyclopedic knowledge.

That Wundt never said anything foolish or brilliant must have been somebody's witticism based on an ignorance of his work, for he made many brilliant contributions to science and philosophy. To mention only a few, his theories of the increase of psychical energy and of creative synthesis and his emphasis upon the value concept in general have had a development in recent years which must have given him great joy. In this idea of creative synthesis the twentieth century seems to be attaining a complete emancipation from the mechanical evolutionary philosophy of the nineteenth century. Even Wundt would perhaps have been amazed at the extent to which this notion has been carried in the realm of biology, psychology, philosophy, and ethics by writers for instance like Professor Spaulding in his 'New Rationalism' and his daring discovery of 'freedom' at each successive level. This is surely 'the new freedom.'

By creative synthesis Höffding says he meant the capacity of producing a qualitatively new content through a composition of given elements. The modern development of this principle to the position of 'freedom' or that "the limit is not a member of the series of which it is a limit," might have seemed rather mystical to Wundt.

In the history of psychology and philosophy Wundt's name will certainly retain a most prominent place. His physiological psychology, his doctrine of elements, his theory

of apperception, his voluntarism, his psycho-physical parallelism, as well as his creative synthesis and his definition of philosophy as a general science whose function is to unite the results of the special sciences into a system satisfying to our sentimental needs and our intellectual impulses—all these and many other original or semi-original contributions assure his standing in the history of philosophy.

Significant also is his long term of service as professor at Leipzig from 1874-1920, forty-six years, and interesting too is the immense body of his writings, embracing according to Hall's estimate about 16,000 pages not including the *Studien*. Even Herbert Spencer wrote less than 12,000 pages and Kant 4,400.

G. T. W. PATRICK

### X

Wundt was a tall, sparely built man with a slight stoop, a large head and a pleasant face. His features were strong and clear-cut. He wore thick, dark glasses which were the outward evidences of the conditions that made it possible for him to contribute to the literature of retinal pathology from his own introspective experience. He could use only part of one retina during the last half of his life. With this partial visual equipment, he did a prodigious amount of work, both of reading and composition.

He worked with systematic regularity. His mornings were spent at home, where he was protected from disturbances; there he divided his hours between reading, writing, and editorial tasks. He used an American typewriter in the days when I was a student in the middle '90's and was very appreciative of its coöperation, and well he might be.

The first semester I was in Leipzig I waited with great impatience, as all newly arrived Americans do, for notices to be posted by individual lecturers giving the dates when they were to begin. In October Wundt's notice appeared. I could not make out from the handwritten confusion the date for which I had been waiting. I was trying to decipher the document when a native arrived. With hat in hand, in my politest German, I asked his help. I stood near and listened

intently so as to make sure that my uncertain command of the language did not leave me in the lurch. It was with mixed satisfaction that I heard his guttural ejaculation, "Mein Gott, das ist nicht zu lesen."

Every morning with his American typewriter Wundt wrote some of the voluminous body of material which remains as his monument. Later, when his eye-sight grew worse, his daughter did much of his writing for him and shared too in his collecting of material.

No one who worked in the laboratory under Wundt can fail to remember the painstaking care with which he went over theses. A part of his morning was given regularly to this kind of work. He edited the *Studien* with personal attention to details and at the same stroke made himself minutely acquainted with the writings of his students.

In the afternoon he took a walk, attended examinations and came to the laboratory. On his arrival at the *Institut* he went directly to his private room, where he held conferences. Once in a great while he would make a tour of the working rooms. He held his lectures usually at four o'clock—well after dark in the winter months of that northern latitude.

Any one who ever heard him lecture will remember the ringing clearness of his enunciation and the sweep of his masterly summaries. He was always vivid and intense. I never ceased to wonder at the enthusiasm which he showed for the details of a demonstration. He would introduce the demonstration apparatus for a reaction experiment and give the steps of the experiment, exhibiting perfect familiarity with the steps of all of its technical complications. Here he was the true experimentalist. Later he would give a review of the history of scientific work in the reaction field, leaving his hearers with a broad, general view which only a master can venture. In some other course he could carry us through the intricacies of logic or ethics or over the successive periods of philosophical thought.

He always spoke with deliberation and emphasis. I remember his telling with great good humor of the permission

he once gave to an American girl who wanted to come to his lectures solely because, as she frankly told him, he pronounced his words so clearly. He used a few notes, but spoke freely and always with that symmetry and completeness of style that characterize his writings.

In the old *Institut* lecture room, where he lectured in my day, he had many auditors, but later the number increased. In the new Augusteum he filled the great Aula. I heard him in 1913 when his strong, clear tones were still readily heard in every corner of the greatest auditorium that the new university possessed, though he was in his eighty-third year. Not an empty seat was to be had. His *famulus* at his direction secured a seat for me as a special honor to an old student by dispossessing a regular *zuhörer*.

In personal ways Wundt was simple, even to the point of impressive modesty. He used sometimes to ask those of us who worked in the laboratory to Sunday dinner. His wife was a stately matron, tall and slender like himself. I always thought of her as of the New England type. At these dinners he would reminisce about his American students and plan trips to America which he felt sure he would never take because of the long ocean voyage. He often went in the summer to Switzerland and in the spring to Italy. He thought some day it might be interesting to go to America—but after all it was too far.

I suppose I should never forget my examination, whatever happened, but I look back on it with more than memory for an important day in my personal career. I had done the proper thing of course and appeared at two p.m. in a dress suit and white gloves. The gloves ripped just as I went into the examination—I suppose as a result of their excitement. I doubt whether I should ever have come through if there had not been some very good psychology exhibited on the part of my first examiner. He asked me as his first question what part of the United States I came from. Fortunately I knew the answer to this question. He asked me what I had read of the English School of Psychology. Thanks to Armstrong's training, I had read Berkeley's 'Essay Toward a

New Theory of Vision,' and we were off—gloves or no gloves. I remember two things about that examination,—his praise of Berkeley for using empirical material as the basis of his conclusions and, second, his general management of the occasion so as to let me show absolutely everything I knew. I went away from that table with a view of an examination that had never been so vivid before. I saw it as an opportunity for a candidate to show his best side, not as a dangerous pitfall prepared by a crafty enemy.

Long years after my student days he took me to his home for dinner. His wife was dead and his daughter presided in her place. It was a simple home, in spite of the fact that he was honored as one of the world's great men. Mrs. Judd and I were hospitably placed on the sofa and we talked of many things, of old friends in America, of the progress of psychology, of my work, in which he showed a keen interest, and now and then, when I came back to the topic, of what he had done.

It used to be the tradition in the laboratory that no one should speak to Wundt about any of his forthcoming books. When I heard it whispered about that the 'Grundriss' was about to be published I went to Meumann and told him I wanted to get permission to translate it. He discouraged me, saying that Wundt's disastrous experience with the French translation of the 'Physiological Psychology' made him unalterably adverse to translations. The difficulty was that the French translation was not revised and so, while the German editions had twice been worked over, French writers were quoting from the original form as it had been embalmed in the French. But I persisted and went to the publisher with the request which I was told not to venture with Wundt. The permission came in the form of a proposal that the translation should be made under Wundt's personal observation and should be printed in Leipzig. In this way I had half an hour every Thursday with Wundt during the spring of 1896. He read all of my proof and commented on it. He found I was off the track a number of times and he made me defend my terminology in a good many cases. I

remember a long discussion on my translation of *apperception* and *perception*. I persuaded him that the English word perception was not what we wanted. That discussion was in his mind seventeen years later when I dined with him at his own home.

I remember bringing him an American review of the 'Grundriss' while we were consulting on the translation. It was by one of his former students. He looked it over, laid it down and said, "Some people read superficially, do they not; it would be difficult to misrepresent a book more completely in an equal number of words." The review did not irritate him in a personal way, so far as I could see, but he was justly drastic in his criticism of its superficiality.

I always found Wundt absolutely objective. I have read the controversial writings in which he took part and I know of his dislike for our great James's views. I know it is said that he felt keenly the dropping away from him of some of his most notable students. I have read his comments on the war and I have great difficulty in placing them in my thinking of him. I am disposed, for my part, to attribute all his scientific quarrels to his sensitiveness and modesty, and his devotion to truth as he saw it. I do not think that in scientific disputes he was partisan for personal reasons. He was absorbed in fact and wholly committed to what he believed to be the correct interpretation. The Wundt I knew never was anything but strictly empirical and objective.

One example, and I think a typical one, of his complete devotion to empirical science came to me in connection with my thesis. Wundt was going over the document in a conference with me, surprising me beyond degree with his familiarity with its details. He pointed to one paragraph and asked for the evidence justifying my conclusion. I did not have any very impressive body of observation to which I could appeal, so I stoutly asserted that it seemed to me '*a priori* wahrscheinlich.' He turned on me with the final and demolishing remark, "*A priori* ist gar nichts wahrscheinlich."

Of his writings and his contributions to science this is not



the time nor context in which to attempt to speak. I have tried to read everything he ever wrote. To me his stimulating thinking has been a source of constant inspiration. I have no trivial comment and no adequate praise with which to express my personal indebtedness to the great movements in psychology which originated directly in his works.

CHARLES H. JUDD

## XI

It is with regret—and chagrin—that I realize that any little contribution to the Wundt memorial meeting that I might have hoped to make is now too late. I can offer as my apology only the fact that press of affairs in connection with taking up my new work at Dartmouth and getting settled in my new home put the matter temporarily out of my mind.

Though perhaps not in a position to judge adequately Wundt's contributions to psychology, I should have had some personal reminiscences which it would have been a pleasure to send, my admiration for the grand old man being very great indeed. But the opportunity being past, I can only express the hope that your celebration has been successful in every way and congratulate you on your contribution towards the restoration of the bonds of international science.

WILBUR M. URBAN

## XII

One recalls Wundt well after twenty-five years, his strangely awkward movements, his rugged, farmer-like, fatherly presence, his keen but genial glance, and his head turned slightly to one side to bring one squarely into the focus of his one good eye. He gave the impression of being fairly tall, slightly stooped and thin, like an ascetic, but he was vivid, eager and human as ascetics never are. He usually wore a dark grey suit, his thin full beard was slightly grey beneath his prominent cheek-bones, and above his spectacles (with one of the lenses semi-opaque) he wore a soft black broad-brimmed hat. His rather quick angular movements were somehow redolent with a fine, almost solemn dignity;

and yet he was always quick to see a joke and often smiled as he conversed. Indeed his heart seemed younger than my own; it was the heart of a sensitive, happy boy. Geniality and fatherliness were the most obvious characters of his attitude toward us.

His handwriting was almost unbelievably difficult and awkward, but not unpleasant to read. His hair was thin above his forehead. His voice was deep, but somewhat husky and nervous, as though it were a bit difficult for him to summon and control it; and yet he always seemed the soul of gentleness and good humor when he spoke to one and he was fond of genial conversation. With possibly one exception, I believe all his special students were fond of him, as I was. He was quick to excuse the shortcomings of others. Of a colleague who was cutting his classes, he said, "He is much worried concerning his son," and went on to explain the nature of the boy's illness as though Wundt himself had been the physician in charge of the lad.

Hence I was thoroughly surprised and mystified by his answer to my question, "Do you think France and Germany will ever again be at war?" It was after a Sunday dinner in his home. His voice was almost raucous with mirth as he replied, "Oh, ja!" as if the prospect, or certainty, were pleasant to contemplate! It seemed utterly at variance with my impression of him, as does today his utterance in October, 1914.

It was rumored in his laboratory that he could be very hard toward anyone who joined issue with him concerning any of his published doctrines. When Külpe's *Einleitung* appeared, Wundt promptly published in the *Philosophische Studien* his article on *Der psychophysische Materialismus*, the name which he labelled Külpe's doctrine of mind and body, —and Külpe had been until recently Wundt's first assistant. I had heard him say that it would probably be a good thing if Germany passed a law excluding all foreign students from her universities, on the ground that they acquire only a smattering of German, "not enough to enable them to read understandingly, for example, the *Philosophische Studien*."

He had a horror of being misunderstood and misrepresented, as who has not? But he no doubt lived in his intellectual activities to a rare degree; he probably identified himself with the children of his intellect as few men do: certainly he had a rare capacity for intellectual drudgery.

A Serbian who was Wundt's *famulus* was once discussing with me what I claimed to be a characteristic of American young men, namely, the effort to live up to a self-chosen standard of personal morality whether the customs of the community required it or not, when Wundt came into the room and Herr Arrer explained to him my thesis. '*Der americanische Idealismus*,' commented Wundt, and laughed gently at my expense. He distinguished between *Sittlichkeit* and *Sittsamkeit* and applied the latter name to the attitude in question. This would seem to be in accord with his own Kantian doctrine of the formal character of duty, the content of duty being determined by customs and circumstances.

No doubt it is true that Wundt's personality was not profoundly ethical: his gentleness *was* paternalistic, not fraternal. He was thoroughly partisan in most of his public interests, and perhaps that is why he seemed to *live* in every structure of his body and mind as few men succeed in doing. Concerning the great philanthropies of American capitalists, he once remarked that German men of great wealth would not as a rule give so lavishly. "Das wäre ein Reichthum!"

Even in his thinking he seemed to strive to be logically consistent with his own intellectual past. Yet, in his partisan way, he revered facts. I once took him the results of some experiments on the two-point illusion (*Vexirfehler*) in tactual perception. After glancing over my tables his comment was, 'unmöglich!' I made bold to ask the privilege of experimenting on *him*, and to my surprise he readily allowed me fifteen minutes out of his daily *Sprechstunde* in the laboratory. At the end of three weeks he asked, "Nun, Herr Tawney, was haben Sie gefunden"? I explained that, for the most part, I had been touching his arm, not with compass points as he supposed, but with cards of various lengths, and he thereupon asked me to write up the experiment, the results of which he had pronounced impossible.

In his lectures he spoke slowly from brief notes. There was a serene work-shop atmosphere in his hall, and although he spoke slowly and with a slight suggestion of weariness in his voice and manner he was never at a loss for words. All his classifications and definitions were perfectly articulated: indeed I believe a greater genius for classification never lectured on psychology. His mastery of his materials was complete,—too complete. The impression I retain of him is that of a master of the art of academic exposition. However, beyond setting for us a pattern to be copied, he did not stimulate thinking. He thought for us: there were no problems left over for us to try our teeth on. Lotze must have produced a very different effect upon the minds of his hearers. Nevertheless Wundt was the most popular lecturer in Leipzig in my time, and the range of his lectures was extraordinary, including jurisprudence and the history of philosophy along with his systematic courses in logic and other philosophical and psychological disciplines. In fact, the wide range of his intellectual mastery was and is amazing, and there is in it a rebuke for the tendency of so many of the newer American colleges and universities to departmentalize and so specialize the work of academic instructors.

His memory seems to suggest that it is not at all impossible that a single individual should master the greater part of the scientific tradition of his time. And yet, a favorite maxim of his was, "*Beschränkung macht den Meister!*"

G. A. TAWNEY

### XIII

The invitation to take part in your memorial meeting, received on my return from France and Italy, contained a note of deep regret for me, since it was the first word to reach me of the death of my old teacher and friend, Professor Wundt.

It sent my memory back a score of years to his study where he lived and worked. Thirteen tables and desks of all shapes and sizes I believe there were in that sanctum—high, narrow, bookkeeper's desks and low, squat ones, and a big, round center table and a new, very American stand with a typewriter on it.

The scene presented a perfect orderliness, but I happen to know there was an adjoining lumber-room where reigned a perfect chaos of dusty books and pamphlets, that always suggested to me the vasty reaches that lie, in the Kantian transcendentalism, beyond the limits of human experience.

The last time I ever saw Professor Wundt was in this room, where he demonstrated to me his newly acquired proficiency on the typewriter, a one-finger exercise to be sure, but not without great gain over his laborious process of writing with an inch-long pencil under the permanent handicap of writer's cramp.

How he maintained such titanic productivity in his literary work was a mystery to us all in those days, but the wonder of it has constantly grown through the years. How with that muscular defect and his pathetically poor eyesight behind dark glasses, he ever carried on unaided the mass of his writing is truly beyond my comprehension, as a mere feat of quantitative production, apart from the quality of the output.

When you ask me what I consider to be one of Wundt's greatest contributions to psychology, a great many of his achievements spring to mind. Of course, historians of psychology will emphasize his service in putting the science on an experimental basis and of establishing the first psychological laboratory. With all modesty and no claim to greatness, we psychologists in America, his followers, might say he contributed *us* and our psychological laboratories.

Apart from these, however, if you want a personal opinion, I must say that the greatest single contribution of Professor Wundt's intellect to me consists in his work and his methods and conclusions in regard to the Human Feelings.

More definitely than any of his predecessors, I think, he grasped the difficulties, logical and experimental, that one must meet in the investigation of the problems of the feelings. He recognized their position on the extreme borderline of possible scientific treatment.

Our Intellect, being our only instrument whereby scientific knowledge can be extended, appears ill-adapted to achieve a mastery of these phenomena. Wundt recognized the

dangers in analyzing and classifying the feelings according to any of the familiar standards of scientific method, also he gave full credit to the feelings for their almost infinite variety, while he deplored the poverty of our language over against the necessity in the science of feeling of meeting the general scientific requirement as to accurate and full recording of results. Nor was he unmindful of the extreme difficulties to be overcome if really trustworthy experimentation is attempted in the region of the feelings and emotions.

But with full recognition of the difficulties and dangers, knowing well that the intellect is very apt, when the feelings are presented to it as subject-matter, to distort them, to convert feelings into ideas, which most assuredly the feelings are not, nevertheless he succeeded in advancing the problem more than any other single investigator and laid out a workable plan for guidance of future investigators in that province.

His work was mainly in the analysis of the feelings, the objects which in all the world are probably the most refractory to logical analysis. He did much to establish Feeling in its proper relations to Intellect and Volition; and he did still more by his treatment of the Emotions. This appears to me to be the spear-point of all the Wundtian theory in the sphere of psychology, and that which is most likely in the future to advance our knowledge of the Life of the Spirit.

EDWARD M. WEYER

#### XIV

My conception of Wilhelm Wundt is that of an inspiring teacher, a man of remarkable ability, and untiring industry and complete devotion to his work. Wundt was a man of very great width of vision, and made contributions in more fields than any other psychologist, I believe.

When he began his work psychology was thought of as a branch of philosophy. His work changed it into an experimental science. This last service may well be regarded as his chief one.

WALTER DILL SCOTT

## XV

During the year 1906 the writer spent a summer session in Leipzig and attended Wundt's large lecture class, consisting of probably 200 students, who filled every available space in the room, several finding it necessary to stand throughout the lecture. No roll was called, no questions asked, no attendance taken and no grades given aside from the signing of the report book at the end of the summer term, as was the usual method of procedure in German universities. In accordance with the German custom, all students assembled before the lecturer arrived and when he entered there was a pronounced shuffling of the feet on the part of the students and a courteous recognition on the part of the professor. The class always considered Wundt a dignified, autocratic type of professor who valued formalities, and frequently spoke of him as *Herr Geheimrat Professor Doctor Wilhelm Wundt*. Professor Münsterberg held a similar opinion, and perhaps the writer was prejudiced in advance of the visit to Leipzig. Wundt was much less formal in his own home and kindly signed the photograph of himself which accompanies this article.

At this time (1906) Wundt was very much stooped, with poor eyesight, being 75 years of age; he lectured with a whispering voice which was difficult to follow in the large lecture room. The writer was much impressed with the careful, detailed analysis that Wundt always made and the fact that he always illustrated his lecture by means of experimental demonstrations whenever possible. Our laboratory experimentation at this time was in charge of Professor Wirth. Wundt was a great philosophical psychologist who had made the approach through the sciences of physiology and physics. Wirth was a careful, technical, laboratory type of psychologist.

In regard to accrediting Wundt with establishing the first psychological laboratory in 1879, as so many authorities do, it should, of course, be recognized that Weber, Fechner, Helmholtz and Wundt, in earlier experiments in psychophysics, anticipated this date. In America James, who had never studied with Wundt, was giving in 1875 a course in psychology



with experiments, in Lawrence Hall at Harvard. James also used experimental demonstrations in his lectures on the physiology of the senses at Johns Hopkins, 1877-78, where Hall and Royce were his students, Hall later attending Wundt's course in Leipzig in 1879-80.

BIRD T. BALDWIN

## XVI

Wundt was well above seventy years of age when the last group of Americans, of which I was one, received their assignments to places in the laboratory in which a long list of distinguished psychologists had received their inspiration and training. Although this was fourteen years before his death, I remember the general feeling of uneasiness which pervaded the laboratory group, a feeling of apprehension, that the aged philosopher would not survive our period of residence at the university.

The cosmopolitan character of Wundt's degree students is a fair indication of the extent to which the reputation of the old laboratory had traveled.

In 1906, at the age of seventy-four, he assigned personally twenty-three subjects of research to as many candidates for the degree. The candidates were assembled in one of the rooms of the laboratory and, after a few introductory remarks the subject of investigation for each candidate was announced, together with a brief exposition of the thesis. The clearness of Wundt's mind at the advanced age of seventy-four, his general vigor and direct attitude in the assignment of each of the doctorate dissertations, lingers in my memory as a classical illustration of the fallacy of age retirement.

Wundt not only assigned the various theses but personally directed their development and finally approved or disapproved them. In approval and disapproval Wundt exhibited the well-known German trait of guarding zealously the fundamental principles of his standpoint. About one third of my thesis failed to support the Wundtian doctrine of assimilation, and promptly received elimination. Whatever may be the merits of German scientific dogmatism, it is no myth and

flourished in undisguised fashion in the laboratory at Leipzig.

The reputation of Wundt secured for him a peculiar kind of reverence, a species of deferential treatment, which the German and certain of the foreign students easily created but which the American student could not readily understand. It was altogether common to observe a small group of the 'intelligentia' often from remote corners of the earth, waiting for His Excellency to pass from the laboratory down the corridor to his lecture room. Disappointed ones were directed to take position at a certain place on Thomas Ring which he was known to pass daily with clock-like regularity. His signature was eagerly sought and was already merchantable in the hands of the professional collectors.

Wundt, in common with the rest of the German intellectuals, regarded with skepticism the English and American forms of social organization. His attitude and action during, and before, the World War are consistent with his belief in German Kultur. I prefer to pass this over and retain my picture of him as the modern Aristotle with respect to versatility if not with respect to originality. The wide sweep of his pen will endure in the records. His charming personality and kindness of manner in surveying the progress of researches by foreigners, struggling with scientific German, must always remain an essential part of the memory of Wilhelm Wundt by those who were privileged to meet him in conference or share his hospitality.

GEORGE F. ARPS

## XVII

I was a student at Leipzig for two years, 1909-11, and during this time I took much work under Wundt. I regard Wundt's systematization of the field of psychology as his most important work. For the first time Wundt gave us a system of psychology, and even although many of us may not agree with the system at the present time, I feel that it has been a great contribution to psychology.

In addition to this I feel that Wundt is to be credited with the encouragement of experimental work in psychology. It is to his influence that we can trace back most of the experimental work of the last thirty or forty years.

Wundt's decided interest in philosophy and the philosophical applications of psychology seem to me to have diverted him from the growing field of applied psychology and he was always more or less indifferent to this field. He cannot have been said to be antagonistic but he certainly was not enthusiastic about it. This even applies to the field of experimental education and I remember in Leipzig a warm discussion upon that point. Wundt eventually came out in support of the new Pedagogical Laboratory, and there was great joy among the teachers when he did so.

When I was at Leipzig, Wundt was of course advanced in years and he himself was not doing very much, if any, actual experimental work. His lectures were always crowded and the cosmopolitan make-up of his audiences was striking. Indeed it seemed to me that there were more foreigners than Germans in his classes. This certainly was true in the laboratory, during the two years that I was there. What struck an English student was the great respect and deference shown by students, professors and assistants to Wundt. To some of us this seemed to go to a ridiculous extent, but he himself took it all very much as a matter of course. As contrasted with this, was the fact that when we needed a laboratory key we had to see the 'Herr Geheimrat' himself and pay him our deposit of a mark or so. I mean it seemed so foolish for a dignified individual, such as he was, to trouble himself about such minor details. What impressed most of us was the ease with which he lectured and the clearness of his exposition in the class room, which was such a great contrast to the involved manner of his books. He always held the attention and interest of his classes and seemed himself to come to his class well prepared and deeply interested.

Wundt always struck me as very unemotional and as such he probably lacks the enthusiastic friendships of other great teachers. No student seemed to get very close to him. His cold intellectuality seemed to make them stand back. I translated his short 'Introduction to Psychology,' but even in the necessary correspondence for that work I did not seem to approach any nearer to the man himself.

I was not at all surprised at the outbreak of the war to find Wundt lining up with the Pan-Germans. Although never expressed openly, it seemed to me in line with his attitude as to the greatness and excellence of German scholarship and, therefore, everything else German. I understand that this German attitude of his existed to the end. This narrowness of mind in a man who obtained distinction as a philosopher was a distinct blow to many of his students, and I am sure it led to a diminution of enthusiasm for the man himself, even although it could not diminish their respect for the psychologist.

RUDOLPH PINTNER

## THE STRUCTURE OF ANIMAL LEARNING

BY J. A. MELROSE

*Janesville, Wisconsin*

### I. THE PROBLEM

The task of clearly objectifying the learning process has proven a difficult one—more than ordinarily so—and for reasons some of which are quite clear. Jennings warns, "Each of us knows states of consciousness only in himself," and yet that we readily yield to the temptation to project our mental states into our interpretations of observed learning, needs no evidence beyond the literature upon the subject of animal learning. From so general and so subtle an error we can, it appears to me, hardly hope to escape even fairly well except by giving rigorous attention to the structure of behavior.

What do we mean by the structure of behavior? Professor Watson defines psychology as the science of behavior, by which I understand him to mean that psychology is an orderly statement of the principles and laws of behavior. This is what I mean by the structure of behavior. For it is of course assumed that the laws of psychology are not arbitrarily imposed upon the facts of behavior, but rather that they merely shape in language the generalized forms which lie hidden within the total of behavior with which descriptive psychology has to do. In order to keep our eyes upon structure in this sense, and to disengage inherited from learned structure, it is well to begin with lower animal forms, where learning is grafted upon very simple inherited behavior and where the imagination is least tempted to take the wing.

But even if we avoid unwarranted assumptions with respect to consciousness in animals, we are not yet done with problems which arise within ourselves. The hidden technic of our own method of reflective learning, together with its

freight of learned associations, are ever insinuating themselves into a product which we think of as wholly objective; for when we are in the act of observing and interpreting our observations, a great organized store of subconscious associations are ready at the slightest unobserved hint to slip into place in our thought, so that truth which we think we have caught in the external world of fact relation may in truth have been largely 'seined from the deep sea of our own associative memory.' What we really see is ourselves. It is only another case of seeming 'to see behind the looking glass.'

It becomes therefore very easy to assume that the adaptive behavior of an animal low in the biologic series is due to consciousness or some intelligent grasp of his problems. Such an interpretation is natural to us and is often extremely plausible. It is not strange therefore that the marked fact in the development of animal psychology is that from the beginning continued pressure has been needed at every point to squeeze out the error that comes from assuming in animals the high states of consciousness and methods of learning which we ourselves possess. There seems to be no good reason to believe that this purging pressure has as yet done its complete work.

By no means the least of our general difficulties, and one that calls for closer attention to the structure of learning, is the state of terminology in comparative psychology. We still employ such words as learning, association, intelligence, reason, consciousness, attention, purpose, etc.—words which bear the major weight of meaning in psychology<sup>1</sup>—without definitive clearness for the most part. In popular thought these words carry a more or less nebulous meaning which gives them currency. In scientific usage we slide them into gearing to do work in different shades of meaning within their general popular connotations. This is done without definition, or by definition confessedly arbitrary. This adds nothing of clearness to comparative psychology, but as be-

<sup>1</sup> We should except behaviorist psychology. Professor Watson in his 'Psychology from the Standpoint of a Behaviorist' discards 'consciousness, sensation, perception, attention, will, image, and the like' and believes they are not missed.

tween the higher and lower levels of psychology, leaves the position of those who hold to larger psychic content for any particular term, and that of those who hold to lesser content, free, as James says, 'to eat each other up to all eternity.' There is insufficient analysis behind our terms and therefore comparative psychology is dependent upon language whose meanings are too vague and general to suit the demands of the positive method.

This vagueness of terms is no doubt in part unavoidable, for it is the perpetual dilemma in the progress of every science, that, while terms must carry as clear meaning as possible, the last and not the first stages of a science, are the definitive stages. However this looseness in the use of terms seems to be in part due to a vicious tendency to impose upon the whole process of learning, descriptions which, at most, are applicable only within restricted limits. Such a word as consciousness, for example, which gets its meaning from the higher human levels, is credited by some philosophic psychologists with the integrating function, which function is found at work also in the very lowest animal forms. On the other hand a too objective view of certain behaviorists, gleaned from observations on the lower levels, is pushed violently up and overworked in duly logical fashion to explain higher learning processes where words of larger psychic connotation are clearly demanded by the facts. Whatever leaning any writer may have with reference to the problems of comparative psychology between these two extremes, his bias slips surreptitiously into his terms so that it is often difficult to be sure of the exact position of any writer whatever.

Now if on the one hand we are to describe, for example, the most primitive integrating tendency of organisms as especially due to consciousness, or on the other hand describe conscious learning by, say, the local action theory of Loeb, or the refined muscular activity of the behaviorists, it is well to note just what we are achieving in such description. It is probably indifferent whether we describe consciousness in terms of biochemistry and physiology, or biochemistry and physiology in terms of consciousness, if we can do either with-



out violence to the facts. Merely stretching one set of terms so that its connotations include the other set, is not making progress however; while to make terms mean so much is quite sure to make them mean not much of anything. Moreover such a transporting of terms from their origin and clear meanings to a realm where they become but vague symbols turns the cutting edge of all clear thinking. What are wanted are the coördinating points which will fix organic learning and conscious learning with reference to one another. Meantime it is better to hold to both consciousness and concomitant bodily reaction, despite any sense of dualism, than to have either one swallow more than it promises to assimilate.

Learning or adaptive modifiability of behavior on the basis of experience begins far down in the animal series and extends up to the reflective learning of man. What can put an end to the confusion which comes from the skidding of undefined terms up and down this learning incline? As we study this learning process how shall we be able to eliminate from the objective product our own projective states and the reflected structure of our unanalyzed method of learning? These are general problems which we have in our tools, beyond which is the problem of the complex facts themselves.

These facts are very complex and hard to isolate. Even the reactions of the 'naked mass of protoplasm' of unicellular forms are very wonderful. As we go up toward higher learning the simple reaction types of lower forms seem to be scrambled together in varied relations. This gives to the problem an inherent complexity, which, since it does not show in movements, is often overlooked. The individualizing tendency of organisms and the resulting unity and seeming simplicity of movements—even those which involve many parts of the animal—give to behavior a deceptive smoothness which has thrown many off their guard. It is therefore not uncommon to find the behavior of even higher animals interpreted with running comments of a thoroughly easy-going sort. This will not do. We must give weight to the difficulty of the problem despite the deceptive smoothness of movement due to the general integrating power of an organism

and its tendency to fuse elements and cover up joinery. Very complex technic appears to issue in very simple smooth behavior.

The difficulties mentioned above conspire to vitiate the importance of animal psychology as a descriptive science. As such it furnishes us with no standpoint from which we can clearly assess our terms, and no means by which we can get the thin edge of a distinction between the truth and a plausibility that has had too easy currency. The study of animal behavior must be pushed forward by attention to quantum (repetition) and relation, which can alone bring a science beyond the descriptive stage. Behavior, especially novel behavior, is interesting, but the structure of behavior—that which is inherited and that which is learned—is more significant. What we are after therefore is that which is repeated, that which can be generalized—that which is mechanistic if you will. We seek in other words that which has structure, and the technic by which it develops and by which it functions.

A search for mechanism here ought to be marked by vigilance and modesty too. We do not need to accept a contract to explain everything. As James says, "The special natural science of psychology stops with the mere functional formula." This does not justify selecting out only those facts or aspects of facts which lend themselves to easy mechanistic treatment, to the exclusion of all others, as it seems to me the thorough-going behaviorist does. Nevertheless at a certain point we accept our data uncritically, and leave it to metaphysics to raise the previous question. But if it is well for psychology to have the control neither to discard troublesome facts because they are troublesome, nor yield to the natural strain to foist our mechanistic conceptions in some manner upon the facts, it is equally good to have the clearness to see that where our discovery of mechanism ceases, there true scientific progress is necessarily at the dead point of the wheel.

All this seems to point to the advantage of attempting to isolate the different types of learning which enter into the

learning process from the lower to the higher levels, in order that each type may be held up separately and its structure carefully examined and analyzed. This paper sets out to make a beginning upon this task. We do not begin with lower learning because this is assumed to be more illuminating in itself. We carry no preconceptions that explanations of animal learning will all but exhaust the technic of learning. On the contrary, such a beginning in the lowest learning and limit in animal learning, merely follows a certain serial order and natural division which the problem presents in itself. A fairly successful analysis within this lower field should furnish a background, clear the perspective somewhat, and eliminate some of the difficulties in the way of the more difficult task of analyzing human learning.

## II. THE LOWEST ANIMAL LEARNING

Learning which we have defined as modifiability of behavior on the basis of experience, is found at the very base of the animal series. On its lower levels learning consists of defining, selecting, and modifying instinctive and random movements. These movements are prompted by stimuli arising in the physical condition of the animal and from the conditions of the environment. The reactions, therefore, upon which learning is grafted are sensorimotor responses and their resultant feeling; the latter on the lowest levels being little more, it seems, than release from stimulation. At any rate the avoiding reaction is primitive and the very lowest forms are limited in their reaction systems to this. Negative reaction therefore appears to be primary and to furnish the base upon which positive reactions are built up.

Learning by direct sense-stimuli is a method which of course continues to function as we go up toward higher learning, but this basic method is added to and improved by means of better structure for both transmission and articulate movement. Our task as we have shaped it is to set forth in order the types of learning which make up adaptation in the animal series. If we can do this and account for the function of each in the learning process, we shall perhaps be able to

clear the ground as we go and so eliminate some of the problems which now beset the analysis of human learning.

#### TYPE A. ORGANIC FIXATION

When we say that an animal displays random movements we do not of course mean that these movements are entirely undetermined. On the contrary each species has its peculiar reaction system, and is limited to whatever repertoire of reactions it contains, or can be shaped to by learning. In higher animals the reaction system comes in a plastic state and is subject to wide changes by adaptive learning. In the lowest forms however this system is very simple in so far as it represents articulate movement at all.

The very first step in learning is the fixing of the reaction system, which in some forms appears to be in the early natal life more or less unsteady and inarticulate. The repeated discharge of the primitive reactions of the organism defines and fixes the system by practice. For example this type of learning can perhaps be best seen in the embryos of fish which first lie on the dorsal side but begin early to try to lie on the ventral side when they swim. The tendency to right themselves occurs in brook trout according to Paton (1907) when they are thirteen or fourteen millimeters long. He does not believe this behavior to be due to the nervous structure, but rather to the position in which the embryo lay in the egg, the shape of the body, and the propulsion of the water. G. M. White says in 'The Behavior of Brook Trout Embryos,'<sup>1</sup> to which I am indebted for Paton's views, that the behavior of these embryos with respect to this matter may be summarized as follows: "The brook trout which has just hatched swims with a whirling movement. About the fourth day after hatching the trout commences to swim in a spiral course, and from then on the movements become gradually better coördinated, the trout swimming in larger circles, and going straight ahead for greater distances."

In all the earliest exemplifications of this type of learning, such as that just mentioned, the process runs along parallel

<sup>1</sup> *J. of Animal Behav.*, 1915, 5, 44-60.

with the process of maturation and it is not clear in any case just what is contributed by heredity and what is due to learning. Some will no doubt claim that the process of ordinary maturation is adequate to explain the behavior, and the excellent coördination of the reaction systems of some animals when they are born gives to this view plausibility. Nevertheless it is placed on the defensive before the general fact of the stamped-in effects of movement. Jennings found in lower forms that any movement once produced is more readily produced again. There is therefore no good reason to assume that the prenatal and early post-natal movements are without any effect upon the organism. I believe these movements do effect the maturing of function. Such a view of learning seems to be legitimized on the same grounds as other views of learning, until at least it is proven not to take place. At any rate this type of learning is so common in higher learning that we are justified in assuming on the general grounds of the stamped-in effects of movement that the early movements of embryos function with the process of maturation in tightening the animal's reaction system.

We have set this type down as the first step in learning, not alone because of its very simple technic but because among many lower forms learning consists perhaps of little more than this fixing by repetition and practice of the simple mode of behavior which came in outline as the motor inheritance of that particular species. It should be noted that the mere discharge of an inherited reaction does not in itself constitute learning, for this reaction may be already fixed and the reaction may be random and may lead to no new adaptive power. This fixing of the reaction system by practice does however mark a real adaptive gain. It lays down no new behavior but speeds up or supplements the process of maturation, and so brings better control over the behavior which the organism already has. We shall describe this first type of learning as *the defining and fixing of inherited behavior by practice*.

This first method of learning reveals no accommodation beyond the fixing process itself. No novelty is introduced

into behavior but on the contrary modifiability is all in the direction of inherited motor tendency. Two facts with reference to this fixing process deserve to be chalk-marked. In the first place the fixing is dependent upon 'trial' or repetition. The reaction system gradually becomes stable by repeated discharge. It is clear also that this result depends upon interaction which goes on within the organism itself, by which the final learned reaction is a middle term between the wobblings to this side or that which make up the respective 'trials.' In the example of the trout embryo above the wobblings are especially marked in the first incoördinate stages and gradually improve from a circular one-sided movement to a spiral rhythmic movement and finally into a straight course. This improvement appears to be due to a progressive tightening of the bilateral control of the organism by means of a process which integrates the effects of the repeated trials.

We should note that in this very first type of learning there is not the mere stamping-in of effects as we are perhaps tempted to think. There is not simply repetition and effect. The stamping-in process would be helpless for learning if it stood alone and unassisted. That there is such a stamping-in of the effects of the repeated discharges is clear, but it is the process by which these effects are assimilated in the learned reaction that is of first importance to learning. This process of assimilation is more than integration of effects. The effects seem to be corrected to one another with reference to the total functional end. They are harmonized to the whole and integrated. The final learned reaction is projected in behavior as a result of this assimilative interactivity of the living tissue.

This simple mode of learning continues to be important throughout the animal series, including man. Many instinctive reactions of animals and man come in plastic state and must be fixed by learning of this sort, although other types of learning also enter into the process as we go up to higher forms. Probably this method is found in primal simplicity only in the embryonic stage of lower forms and

elsewhere is more or less complicated by other types of learning which fuse with it. However, it continues to be a very important factor of all grades of learning even though it is often hidden amid the complexities of behavior. The baby learns to hold his head steady; the child to fix his A-B-C's and natural numbers; and the philosopher to give an orderly statement of the points of his system by employing the fixing method, although, as we have said, as we thus ascend the scale of intelligence we make draft also upon modes of learning other than this. Nevertheless the ground plan of the process continues to be the same fixing toward a functional end of the subject himself by means of repeated trial and the elimination of error on this side and on that.

#### TYPE B. ORGANIC SPACIAL ACCOMMODATION

The simple problem of lower animal forms is, as we have suggested, either movement, prompted by the organism itself, over a path free from unfriendly stimulation, or movement to bring relief from stimulation from the environment. In the solution of this problem animals very low in the biologic scale make some advance upon the basis of experience beyond the mere fixing of their reaction systems as mentioned above. Experience introduces some novelty into their behavior, achieved in accommodation to their environment. Repeated stimulation from the environment causes the animal to eliminate certain movements or change their direction, thereby increasing adaptation.

Let us describe this first phase of environmental adaptation in the most objective way and then analyze it somewhat. We shall call it learning by *the repetition of direct sense-stimuli and the assimilation of the result*. When an earthworm, for example, no longer turns to the right after having had repeated contacts with an obstruction on that side, he exhibits this type of learning in simple form.

Given the repeated contact stimuli from the environment, this type of learning is dependent upon the power of the living tissue to make an organic synthesis upon the basis of the loci of the points of stimulation. Of course the intensity, fre-



quency, and recency of the stimulations affect the reaction but only with reference to the relative rapidity of learning. The direction of the learning, and that is what we are interested in, is determined by the location of the points of contact. It is clear that the repetition of stimuli which this type of learning requires, demands some sort of rough uniformity in the environment. The learned behavior which is finally projected follows a path which has been accepted through the elimination of certain movements and directions. The repeated trials and unfriendly stimulations leave open freedom of movement, for example, to the right or to the left of the source of stimulation, or through a course between opposite sources of stimulation.

If we look too casually at this learned behavior—the process and the final result—the description of ‘trial and error,’ or ‘trial’ seems to be adequate. This is true, however, only because the most significant point in this mode of learning is not always apparent in behavior. An animal which, for example, after repeated stimuli on the left side no longer turns that way, does not appear to act so differently from an animal which after repeated avoiding reactions and slight turns to the right, passes safely by an obstacle in his path. Both of these cases show ‘trial’ and achieve success. In short as objective behavior they look very much alike. Nevertheless in their inner technic these two cases may contain all the difference which lies between adaptive learning and fickle chance. The description which we are offering therefore calls attention to the interaction within the organism itself and by this means enables us to get a more discriminating objectivity than that contained in the notion of ‘trial.’

This fact will become clearer if we lay this learning out in its most meaningful exemplification, where the possibility of ‘trial and chance adaptation’ are necessarily eliminated. If for example we view over against its final learned pathway, the repeated attempts of the earthworm to pass down a narrow alley, subjected to slight electric charges on either side, we may see this mode of learning of type B laid out in

clear pattern. The interaction of the organism is now clearly objectified in behavior. The animal first moves in a zigzag course from side to side because of the shocks received whenever his body comes in contact with either side of the alley during his exploring movements. After repeated trials however his course approaches a straight middle course between the two sides.<sup>1</sup> It is very clear that as this process goes on, the effects of the stimuli are assimilated by the organism, and that the middle course selected is the projection in behavior of this synthesizing process.

It appears therefore that the notion of 'learning by trial' is not a very significant description of learning. It fails to locate the frontier boundary between learning and the 'no man's land' of chance. Jennings describes as typical of paramecia the following behavior: "An individual swims against it [filter paper], gives the avoiding reaction in a slightly marked way, swimming backward a little. Then it swims forward again, jerks back a shorter distance, then settles against the paper and remains. After remaining a few seconds it may move to another position, still remaining in contact with the paper. Then it may leave the paper and go on its way." Now the paramecium so described has made trial in his own exploring way and passed on; but while its behavior has shown a good deal of apparent adaptation, there is no evidence that it has learned anything. On the contrary, it is apparent that bacteria may by repeated kickback reactions and successive turns to the right or left adapt to obstacles in their path and so succeed by 'trial,' but the simple reaction systems of these organisms appear to do no better after a thousand trials.

The widely used description of 'learning by trial' therefore needs further analysis. Trial is not the significant fact in learning. There may be trial without learning. In the first place, animals which appear to be incapable of learning beyond the fixing of their reaction systems make trial in the usually accepted sense, and beyond this depend

<sup>1</sup> R. M. Yerkes, 'The Intelligence of Earthworms.' *J. of Animal Behav.*, 1912, 2, 332-352.

on chance adaptation. On the other hand an individual with acute power of learning might make many 'trials' and learn nothing. There are two requisites for this type of learning apart from which the notion of 'trial' is irrelevant to learning, and functions only in the realm of chance. Both of these requisites are clearly supplied in the example we have given of the earthworm adapting his movements to the alley. In the first place there must inhere in the stimuli that which makes them capable of assimilation or synthesis. Put in its most general way this means that there must be some sort of uniformity in the environment to which adaptation is to be made; for no other environment could furnish stimuli capable of being assimilated. Still more interesting for our purposes is the other requisite, that the animal shall be capable of making this organic synthesis of the effects of the stimulations. These two requisites are what lift 'trial' and 'searching' above pure chance and give that adaptive progress we call learning. We have therefore marked these requisites clearly in our description of this learning as the repetition of sense stimuli and assimilation of the result.

A word ought to be said at this point with reference to the relation between type of learning A and type B since they are especially foundation types. Professor Warren in his 'Human Psychology' appears to have been the first to distinguish between these two types of learning as they appear in human learning, under the terms 'fixation' and 'aquisition.' This is a very fundamental distinction in learning. Nevertheless when we get clearly in mind the method of description which we have applied to these two methods of learning it is clear that the gulf which separates these two methods of learning is not very wide in fact. Both types represent the same technic of repetition and assimilation. In the first type however the stimulations come from the nature and condition of the organism itself, and its inherent tendency to discharge its native reactions, while in type B the stimulations come from the environment. The first type is therefore an adaptation to the nature of the

animal so to speak, while the second type lays behavior out adaptively to the environment.

In neither of these two primal modes of learning is repetition itself necessarily meaningful, nor are trial and success as such. The working out however of a simple mode of behavior on the basis of the stamped-in effects of repeated stimuli, and a rough working of the law of averages among repeated opposite stimuli, is the illuminating phenomenon, whether the stimulation comes from the organism or the environment. This is a fact of signal importance to learning. It does not seem too much to say that this general technic, found at the base of learning, lays down the mosaic background upon which the structure of the learned behavior of animals is laid out in figure.

#### TYPE C. ORGANIC CHOICE (ADAPTATION TO FUNCTIONAL MEANING)

The next step in learning which seems to possess definitive clearness is the shortening all at once of a serial reaction, learned perhaps as in type B, by the elimination of some or all of the middle terms and passing more directly from the initial to the final term of the reaction. Let us illustrate this mode of learning by epitomizing an account of the behavior of a stentor as given by Jennings. Carmin is added to water in which a stentor has been placed. The following change of behavior is noted. The animal first turns to the aboral side to avoid stimulation. This may be repeated. Ciliary currents are suddenly reversed if the stimulation persists. This also may be repeated. The animal then contracts. After this is repeated and accentuated, the animal abandons its tube and swims away. This full reaction is given because of values it has for the discussion later. For the matter now in hand let us suppose that the stentor gets relief from the stimulation of the carmin by contracting into the tube. At length it comes out and the water currents of the ciliary motion again strike the disk. Suppose carmin comes again, what is the usual reaction? Let us quote Jennings:

"The stimulus and all the external conditions are the same

as they were at the beginning. Will the stentor behave as it did at the beginning? Will it at first, not react, then bend to one side, then reverse the current, then contract, passing anew through the whole series of reactions? Or shall we find that it has become changed by the experiences it has passed through, so that it will now contract again into its tube as soon as stimulated? We find the latter to be the case. As soon as the carmin again reaches its disk, it at once contracts again."<sup>1</sup>

This third method of learning is expressed by Jennings in the simple formula, reaction *ABCD* becomes reaction *AD*.<sup>2</sup> He believes that the middle terms *B* and *C* are not wholly eliminated, but are run off so rapidly as not to appear in observed behavior. However for our purposes we may say that the response which has proven most useful to the animal, in time, entirely overcomes all responses of lesser meaning. Let us call this learning *the repetition and shortening of a serial reaction*.

It should be noted at once that we have here the same background of repetition and assimilation; but the latter is no longer operation with reference to the loci of the points of stimulation, but with reference to the relative intensity or meaning of the stimuli and responses. This learning looks like association and comparison but it is better to avoid words of intellectual connotation. Jennings says it is due to the law of the 'ready resolution of physiological states.' This description has the merit of calling our attention to the interaction of the organism itself, but it takes the matter out of the field of scientific objectivity for the present as effectively as does description in the most intellectual terms. This learning seems to be adequately described if we say that the relative intensity or meaning of stimuli and response is stamped in by repetition and that organic assimilation, everywhere at work in the background of learning, selects out the final learned reaction.

The description above attempts to assess this third type

<sup>1</sup> 'Behavior of Lower Organisms,' p. 175; see also pp. 287-292.

<sup>2</sup> P. 290. Thorndike also brings this behavior out in on experiments chicks, dogs and cats.

of learning as a form of reaction to the environment. Let us look at the possible effect of the process involved in this learning upon the organization of the reaction system of the animal. Suppose we express the complete serial reaction of the stentor as given above in terms of an *ABCDE* serial reaction. Let us now suppose that the *B* response is eliminated from usual behavior and that *ACDE* is the total reaction for the time. Finally *C* is dropped and in due time *D* also. *AE* now becomes the usual adaptive response by the process of elimination we have described above. No one of course would assume that elimination will happen in just this way always, but the assumption in the form we have made it will illustrate the point we are urging.

Now presumably in the experience of the animal conditions may arise in the future which may call up anyone of the previous reaction series, or even bring it about that one after another shall become the most usual response in ordinary adaptation. All that is demanded for this to take place in some manner or other is a changing environment; for the neural organization already has potentially present any one of the following reactions, *ABCDE*, *ACDE*, *ADE*, *AE*, and in addition, because of the nature of the process of associative assimilation, the incipient beginnings at least of *ABDE*, *ABCE*, etc.

Now by the process of ordinary selection in any given environment, some of these potential reactions would be overlaid and lost, while others would be stamped in by use,—some more, some less—in the ordinary round of stimulation, response and adaptation. The repeating of whatever reactions the organism retained and the assimilation of these stamped-in effects, would give to these reactions an internal organization and relation among themselves. Such an organization as would in this manner be built up in the centers would appear to be just the sort of organization we are forced to posit behind the well-known graduated repertoire of reactions which many animals release under stimulation, and which is very well illustrated by the serial reactions of the stentor as given by Jennings. If this be correct,

this third type of learning is especially responsible for the repertoire reactions which many animals display.

This type of learning which involves the elimination of some of the middle terms of a series also appears to explain the real nature of the difference which exists between the kinds of association. Once the simplest form of association—association by contiguity—has been reached in the learning process, this lower form seems to become association by contrast or similarity by means of this simple technic of type C. From a series of terms strung together by association by contiguity, we get the higher forms of association by the slipping out of those terms which have little selective value to the particular mental 'set' or purposive attention which the mind may at the moment happen to have. This matter is too involved to go into here. Professor James's discussion of associational processes<sup>1</sup> will be found, I believe, to connect well with this view, and furnish strong evidence that Jennings's 'law of the ready resolution of physiological states' forms the organic background for the differences which obtain between association by continuity and higher association.

Type C also furnishes the organic basis for comparison and choice of the definitely conscious sort. While it is doubtless true as James asserts that the reflective attitude becomes the habitual adult attitude, it is likewise true that we greatly overestimate the importance of the reflective function in ordinary routine matters. Reflection itself is for most persons in most activities probably at a minimum, but a telic attitude laid down by reflection sits in judgment over much of our behavior. The unconscious method of comparison which we have noted in this type of learning always gets in on the ground floor and continues to be very important in human behavior, and much that we think of as reflective choice is only so after the event, when the results of the choice are picked up by the smooth delicate technic of intellectual reflection. Some of our choices are of course highly reflective. Some persons make many of their choices

<sup>1</sup> 'Psychology,' Vol. I., ch. 14.



this way. Probably most of our choices however have only a small modicum of reflection in them, beyond which they rest back on the results of this unconscious process of organic comparison.

### III. HIGHER ANIMAL LEARNING

Types of learning A, B and C appear as we have seen in lower forms of animal life; for they require nothing beyond direct sense stimuli and resultant feeling. Organisms which do not possess the senses of sight and smell seem to be limited in their learning to these three types. Learned behavior beyond these probably has to await the cephalization of receptors with the attendant differentiation of the senses. These senses extend the capacity of types of learning already present and add new types. The importance of the eye in learning is well known. The sense of smell also comes early into play and is thought to fulfil an important function in adaptation. The senses of hearing and taste, while very important, are not especially unique in method.

#### TYPE D. ORGANIC ASSOCIATION (ASSOCIATION BY CONTIGUITY)

The technic of learning by odor appears to be very simple but it is structurally different from the types we have considered. An animal which by repetition of stimulation comes to know the odor of persons, companions, or certain food, connects the odors with the objects respectively, or as we would say associates the two so that the odor quickens and guides the search reactions. Many animals appear to have very acute sense of smell and remarkable powers of differentiation, and this sense is conceded to be very important in learning. With respect to this sense the insecta are especially remarkable. The quickness of the dog and many other animals to learn by odor is well known.

The structure of learning by odor seems to be all of this associational type, as is also the simpler learning through the eye. Learning by sound and taste is no doubt of narrower range but is probably all of this type. The structure of this mode of learning is distinguished from the associative

comparison of type C in this, that the connection in type C is in the direction of a motor serial reaction which has been learned, and consists in merely shortening this series; whereas in the type under discussion the odor for example becomes connected with the food, which means that *a cross connection, so to speak, has been made and a new term of adaptive value added.*

Lubbock's experiments with ants seems to prove clearly that they find their way to food or back to the nest by following the trail of companions by means of their sense of smell. Lubbock found that when an ant returned to the nest with food and then made the return trip to the food, other ants followed. By using a movable path Lubbock showed that these ants did not follow the other ant but followed its trail on the path. It is also thought that bees come to the honey in the flowers by associations of odor and color. This general field is controversial however. The local action defenders have their views, and it is not clear also just how much of this wonderful behavior of insecta is due to inheritance.

Romanes has given results of experiments with a favorite setter which are clearer. Romanes used twelve men in the trial. It was first found that, besides his master, the dog would follow only one of these, the gamekeeper, and then always as a second choice. Romanes set out followed by the twelve men, the gamekeeper in the rear, and each man taking care to step in the footprints of Romanes. After some distance had been covered Romanes turned to the right followed by five men, while the other seven kept to the left. The dog was put on the trail and without hesitation took the right trail when she came to the divergence.

Associative learning by sight is even clearer. Morgan cites an interesting instance in the behavior of a moorhen which we shall quote. "A moorhen chick, for whose benefit we had dug up worms with a spade, and which, standing by, jumped on the first-turned sod and seized every wriggling speck which caught his keen eye, would soon run from some distance to me as soon as I took hold of the spade." Whatever degree of intelligence we attribute to this chick and

whatever may be the points of connection in learning, the instance shows some form of associative learning.

It is of course not assumed that in this learning there is any analysis on the part of the animal, nor is there association in our full sense of the term. There is connection with adaptive action. Association begins, as James points out, in association by contiguity, and this type of learning marks its beginning. Perhaps it is limited in animals to this beginning. At any rate we should assume with great caution that there is in animals any recognition of similarities or contrasts. Of course there is more refined associational connection as experience proceeds, but there is no need to assume that the technic of association is altered. It seems to me that the simple connections of which animals below man are capable merely release the learned reaction with which it is connected. The reaction situation whether it is gross or fine is always, in other words, a total situation. There is no analysis except the organic analysis of the assimilative process. The animal either acts or is confused in the presence of a situation.

#### TYPE E. THE ORGANIC CONCEPTION

Apart from vision animals would seem to be limited to the learning types we have considered. Retinal response however introduces new elements into learning. Other kinds of stimuli come in succession, but the fact of simultaneousness in retinal stimulation and response adds to the fact of succession of stimuli a side-by-sideness of stimuli. On this account there appears with vision learning which looks like association between concretes, and which Hobhouse believes to be such if I understand him. At this stage of learning an animal may *respond to a new situation in a manner which shows the contribution of past experience with similar concretes and yet so as to indicate that it is not wholly determined by such experience*. For example, a dog by experience with this, that or the other house comes to be more adept in accommodating his behavior to any particular house.

Hobhouse tested a fox-terrier by taking her in a box to

the second floor of a strange house. The dog's master called her from without and the dog saw him from the window. After some hesitation the dog 'soon started off, and went steadily out of the door, downstairs, out of the house door, and round the corner to her master.' Again, "a dog is held at the back of the house, and sees his master go in through the back door and reappear at the dining-room window, which looks in that direction. After trying to follow his master through the back—unsuccessfully because the door is shut—he makes off round two corners to the front door, and so into the dining-room. He had never been in this room before but has once been from the back into the house by the front door." Once more, "A little fox terrier had once found her way from the back of the house through the front door into the dining-room to her master. I then took her out again, the master remaining where he was, to the same place outside, closing the front door behind me. After trying the front door several times, she at last set off round a further corner of the house, and found the side door, through which she got into the house and found her master." Hobhouse believes these dogs found their way by 'familiarity with houses, staircases, rooms and doors' and by the apparent use of what in humans we call common-sense. Let us attempt to analyze this learning.

To characterize the type of learning which we have described above in type E as association between concretes seems to me to go too far for the facts in one direction and not far enough in another. It would perhaps be hypercritical to find fault in this connection with the expression 'association between concretes' as at least a helpful part description of this behavior, provided only we make the clear reservation that animals probably never do more than attend to the high points in a stimulation situation. Situations seem to be to them always gross situations, and surely stop short of analyzed concretes. With this reservation we may let the expression stand as in part correct, and very convenient verbally.

But there seems to be more than attention to and associa-

tion between concretes in this behavior as Hobhouse describes it. Mr. Hobhouse seems to think so; for he finds a place in this learning for 'practical ideas' and 'class inference,' and I take it that some such hypothesis is by him judged to be the best way to account for the elements in this behavior which are not adequately explained by a 'knowledge of concretes.' The behavior of the house-broken dog goes beyond mere habituation. There is some evident freedom in it. Something beyond association between concretes is surely demanded by the fact that an animal's skill in adapting his actions to any house grows *pari passu* with his experiences with houses. It is at any rate not clear in what way a one-to-one association between the high points of experience could effect this result.

But Hobhouse's notion of practical ideas is unsatisfactory. Proof is lacking that any animal below man makes use of ideas, as the term idea is employed in ordinary usage. Of course they appear to do so. No one however has seriously urged that any animal below man ever analyzes out similarities or identities on the basis of either order, quality or relation, and the progress of research makes it ever less likely that such a claim can be made. This fact does away with the notion of 'idea' and 'class inference' if we are to be cautious in our terms. No doubt the word idea might be used in the sense in which Hobhouse uses it and the difference of opinion be reduced to a matter of definition. Evidently the word 'practical' in the phrase 'practical ideas' is intended to do this. But it does not wholly prevent a vicious stretching of terms. Besides the word idea is not just the one the facts demand as we shall see.

Let us look more particularly into this mode of learning as seen in the examples of the dog fitting his behavior to the house. First of all it is clear that there must be some knowledge of and association between concretes (the high points of experience). In the second house of a dog's experience this must be so. It is not clear that there could be less and be any learning of the sort we are considering and there could obviously not be more than a one-to-one associa-

tion in second house of experience. Since we are not admitting any knowledge of isolated-out concretes however, this association of the second-house stage would not be structurally different from type D. Any difference between this learning and that cited in type D, is a difference in degree and not in structure.

But in the example of the dog, as experiences with more houses come, adaptation increases. The matter looked to Hobhouse like 'class inference' and it is this for which the one-to-one association seems inadequate. It is not the smoothness of the adaptation alone which shocks our credulity; for it is a well-known fact that associations may come with kinetoscopic rapidity. But any selective law is wanting by which any one-to-one relation between concretes would bring at each point of the present problem just that association from just that particular house of the houses of experience, which would best adapt to the present problem. Now if such a one-to-one association were nevertheless conceived of as the basis of this learning, then the freedom of the learning is only apparent. The behavior would in this case be made up of many fixed reactions pieced together, so that while the whole is not made on a set plan, the parts are. But if this be the case we have in turn no new learning structure that is unique, but a rapid exemplification of the type described under type D. Indeed, if we are to go so far in the name of a one-to-one connection it were better to go further, and declare, unless prevented by some good reason, that there is no association whatever but a mere kinetoscopic releasing of reactions due to stimuli which to the animal were identities. The sight of the high points merely released learned reactions.

But such a view is not satisfactory. It taxes our credulity. It is not only difficult to see how wider experience could increase adaptation, except within modest limits, upon the basis of mere association; but it is also difficult to see what would prevent such increasing experience from resulting in confusion which would paralyze action. What advantage can come from multiplying learned associations where there is no selecting or generalizing principle at work? It is in

this situation before the facts that we feel the need of something comparable to Hobhouse's 'practical ideas' and 'class inference' to account for the nature and increase of adaptation.

That which appears to be needed to clear up this phase of the problem is appeal once again to the assimilative process which we have been able to discover at work in simpler lower learning. Let us now look at this type of adaptation with the facts of this appeal to organic synthesis in mind. In doing so it is of course agreed that the dog's adaptation to the second house of experience, in so far as it is learned at all, is by means of a one-to-one association. The problem to be further discussed lies beyond this in the smoother adaptation which a dog achieves through experience with houses.

Now experience with houses would in the first place, by the ordinary effects of repetition, stamp in the various 'high points' of attention which remain constant in the several houses of experience. Differences among the concretes of these houses would receive no such inforcement and the effects of such concretes would fade out. This process working in progressive experience would stamp in the points that are repeated—those that are always present, usually present, often present and sometimes present—so that the total effect when gathered up by the synthesizing process of assimilation, would constitute not the stamped-in effects of experience with this house or that, but a complex of a generalized house, integrated from the several houses of experience. In other words the results of the stamping-in process, carried on and corrected to the needs of action, would be to stamp in the neural centers a generalized motor response or repertoire of responses to a generalized house. In other words, the stamping-in of effects and assimilation of these working upon progressing experience selects out a schematic organization in the nervous centers which gives to motor behavior not a fixed but a generalized and so to speak graduated adaptation.

It will perhaps help us get this view objectified if we conceive of this stamping-in of effects and the integration



of these by the assimilating process, if we illustrate the process under the figure of successive pale ink imprints of many somewhat different forms, which however have a generalized similarity and are stamped upon a common center. The resulting composite imprint would have the following characteristics. The center would be very dark and in general the imprint would grow brighter as you approach the margin. The dark parts would extend from the center according to the generalized form of the several dies. Just beyond the dark center would be a middle area, which, while it did not receive all the imprints, received at various areas from many to few imprints according as the various imprints touched these respective areas. The periphery would be pale to very pale having received say three or two or even only one impression according to the projections of the dies and their overlapping margins.

If now we make a hasty comparison between the learning of type E and this composite imprint we have the following suggestions. The darker center of the composite imprint corresponds with that neural structure which has been laid by off-repeated experience and which therefore controls the more fixed elements in the motor adaptation. This part at the very center is no more than stamped-in effects. The next area in the imprint shades from dark to light, according as its parts received many or few impressions from the dies. The neural area which corresponds has also been differentiated by the stamped-in effects of different experiences, which nevertheless have points of similarity among themselves, and this mottled structure carries a rich repertoire of potential reaction, which is drawn upon as needed, by the stimulations of the present experience. The extreme outer margin represents especially the growing part of the complex where new one-to-one connections are made and where structure capable of no more than this, becomes by reinforced experience more generalized structure like that mentioned above.

The learning then of this type is complex. It depends upon a complex neural structure which offers to adaptive behavior a certain general fixity built up by the constants

of a class of similars of past experience; a field of rich repertoire and free adaptation laid down by the relations of similarity and difference in this class of similars; and structure adapted to one-to-one association in which this type of behavior has its beginnings. The confusion and the lack of uniformity in the animals running off of this type of behavior, which has been remarked by Hobhouse and others, is due to the nature of this complex structure. Any single instance of this type of behavior may however draw upon all of these parts and yet be smooth adaptation.

This neural complex which we have endeavored to describe is the organic background of the concept and it may be wise to turn from the schematic description above and consider this learning with reference to the functional use of the concept. The intellectual concept is formed largely by elimination. It is what is left after a class of similar concretes have been generalized. For this reason a concept lacks in definitive clearness in the strictest sense. Anything we may say about any concept is more or less true. We can for example hardly define the concept house. Some parts of a house are present in all houses but all minor parts are subject to variation in size, shape, and position. Other parts are usually there, some often and some seldom present. In short a concept is not in primary structure an intellectual thing, and therefore is not subject entirely to definition. It is in its genesis organic and its structure is suited only to adaptive use.

The concept comes from integrating on the basis of the law of averages of a class of similars. It is often a mere name or sign of this generalized whole. Its real meaning however centers in the relative constant elements in the class, together with the umbrage of less constant values surrounding these. The outer margin is negligible in abstract usage, but possibilities of associative connection lie hidden here, which may be called out in the presence of any particular concrete of this class. The concept grows by recognizing new similarities in the class, and this happens only when experience with the concretes of the class widens. Now it would obviously be quite impossible for us to handle

in thought any great number of concretes and manage them at all well, if it were not for this technic of gathering them into classes by the concept. Only by this means do we adapt our thoughts to concretes in a smooth and discursive manner.

In the learning of animals we are not dealing with thought adaptation but with motor adaptation. But the thought adaptations have come from the motor adaptations, and the organic generalizations which the latter achieve have given the ground plan to the process of conscious intellectual generalization. The technic of the intellectual concept has come in other words from the 'organic concept.' The process of organic assimilation working upon the animal's associations between the 'high points of experience' builds up a motor association complex, and this complex furnishes the neural structure by which the animal's behavior among a class of similar concretes becomes discursive in motor behavior. We feel justified therefore in describing the learning of type E as *the use of the organic concept*, and we may assert that man, despite his conceptual powers in the intellectual sense, makes a large use of this organic concept.

#### TYPE F. THE ORGANIC JUDGMENT

Among the higher animals below man and especially among the other primates there is evident a still more complex expression of learned behavior. *This behavior manifests association between complexes—between relations. The adaptation shows a rather nice accommodation to the general problems of the environment.* Mr. Hobhouse believes that learning of this type displays some use of the practical judgment. By this he means that there is a correlation between a 'practical idea and a remoter end.' Upon this point he is cautious, I think, but believes that the nature of the adaptations which apes make requires this view and for some of the adaptations of other animals it is the best working hypothesis for the present.

The best examples of this type of learning are found when animals are adapting themselves to humans or other animals, for situations here are sure to be more or less dynamic and

hard to meet by habit learning. Hobhouse limits the higher expression of this type to primates which he says use 'articulate ideas' and make an inferential 'application of experience.' We are not able to see that any animal behavior goes beyond the general descriptions of this type F which is shared in different degrees by all higher animals. We shall say a word presently about Hobhouse's 'articulate ideas' and 'application of experience.' Let us first give concrete example of this type of learning.

"One of two dogs, the larger, had a bone, and when he had left it, the smaller dog went to take it, the larger one growled and the smaller one retired to a corner. Shortly afterwards the larger dog went out; but the other did not appear to notice this, and at any rate did not move. A few minutes later the large dog was heard to bark out of doors; the little dog then, without a moment's hesitation, went straight to the bone and took it."<sup>1</sup>

This behavior indicates a connection between the learned relations, 'bone at such a place is wanted,' and 'Big dog out-of-doors is at a safe distance.' If we were to put these into intelligent human thought for the little dog they would be shaped somewhat as follows: "I want that bone from which the big dog drove me, and now that he is safely out-of-doors I may go and take it." There is no need however to assume upon the part of the little dog any appreciation of all this. We may substitute for this intelligent interpretation of thought and telic aims, the stamped-in effects of past experience and functional ends. This is the interpretation which we are giving.

This behavior shows association between complexes or relations but it requires more than this for its explanation. Also just as we stressed above the wisdom of using the word idea in accounting for that in type E which association between concretes did not cover, so now, for the same general reasons we must disapprove of the word 'judgment' to account for that for which connection between complexes has

<sup>1</sup> Hobhouse, 'The Evolution of Mind,' p. 264, as quoted from Morgan's 'Comparative Psychology,' p. 300.

too short a reach. Nevertheless something comparable to 'judgment' is needed to account for this adaptation.

Let us see. We have discussed above the process by which a complex is built up about experience, with a similar class of concretes, by means of which simple complex the animal makes motor adaptations to any member of this class of a discursive sort. This was effected by repeated association between the concretes and assimilation of effects. This learning which we are now analyzing goes a step further in the same direction. It begins not in association between concretes but in association between relations or complexes. As the connections are repeatedly made between the members of a class of similar relations in experience, synthetic assimilation is at work on the effects, as ever, and by means of both of these, association and assimilation, a larger and looser complex is shaped which is the background of this behavior and the organic basis of the judgment. We shall call this type *learning by means of the 'organic judgment.'*

This of course differs widely from an intellectual judgment, however 'practical' such a judgment may be, for it is merely a motor adaptation, a projection of an entirely unconscious sort of the effects of generalized experience into behavior. When man knows "he knows that he knows." His adaptive processes have become conscious and thereby his powers have been infinitely enlarged. It should be noted however that the intellectual judgment gets its structural type from the organic base of this learning of type F.

A judgment is a generalized expression of relation. It is a generalized form ready to be supplied with one of a class of contents, according to the present selective function of thought, and it is this structure of the judgment which gives to human thought its discursive nature. Likewise this type of animal learning is a generalization among the relations of motor experience, in which a class of relations are so generalized in the neural tissue, that any one of the class of relations may be fitted to it as a content and so adaptation among the class become discursive.

Such discursive behavior is especially called out by animal

play, or by an animal's adaptation to men, such as a dog's behavior to his master; or by complex problems of the hunting type. Of course in this higher learning lower types are usually also at work, but it is this highest form of animal learning which makes some of the behavior of animals in a variable environment look so convincingly like the use of prevision.

As stated above Mr. Hobhouse believes that animals also learn by 'articulate ideas' and by 'a spontaneous application of experience.' Let us consider these two modes of learning to see if they may not be included within the structural types we have already considered.

By 'articulate ideas' Hobhouse means, it seems, ideas which have a decisive concrete clearness. A dog may learn to push a bolt to one side. This requires a 'practical idea' only. A primate may learn also to push a bolt 'until it clears a staple,' which requires an 'articulate idea.'

This looks like a new type. Without doubt it goes beyond behavior we have described. It is not however in my opinion based upon new structure, but rather represents the integration of type E with type C. In other words type E is perfected to a point where type C functions within it. The 'organic concept' in the learning of a dog or cat may always remain too gross for this to take place. The monkey however with larger exploring tendencies and more refined attention registers successes attained when the bolt is pushed by the staple, and in due time drops all unprofitable movements, retaining only this successful reaction. The shortening of the learned reaction is what leaves this behavior so striking.

Again, learning by 'a spontaneous application of experience' is distinguished from habit and associational modes of learning in a decisive manner. It is not merely based upon experience. It is in the form of a hypothetical inference from experience. This novel reaction to the environment, Hobhouse believes to be limited to primates.

I have however observed this type of behavior in more than one farm dog which had become a practiced groundhog

hunter. Whenever one of these dogs came into the vicinity of a woodchuck hole, he would strike a hunting 'set' and after advancing a few steps slyly, make directly for the hole at full speed. This he did even if the 'chuck' had been espied at some distance to the right or left. This surely looks like prevision. The dog seems to say, "If I can get between the hole and the 'chuck,' I have him."

It seems to me however that we have here no more than organic learning. Let us see! Suppose we consider this type of learning as type C functioning within type F, what can we make of it? This seems to me the most likely interpretation.

It should be noted that all previous experience of these dogs with groundhogs had centered about their holes. The pursuit had time and again ended here. Arriving just too late on many occasions has made the hole the hot center of this experience. Besides if chucks were caught in the past it was usually just as they were about to dart into the hole. No matter where the chase began, what its direction or fortune, it ended at the hole. The hole therefore becomes the controlling point—both the constant in the complex and the point of highest meaning—and all other behavior is in due time eliminated in favor of 'making direct for the hole.' This behavior is then due to the 'organic judgment' perfected by the 'resolution of physiological states.' That is, it is the integration of types F and C.

The 'organic judgment' unquestionably fills a big place in human adaptation also, especially motor adaptation. Anyone who has watched the process by which he gains in skill in playing a competitive game, must have been impressed by the distinction between the function of the 'organic judgment' and the reflective judgment. One does not learn to play a game of skill by reflection but by practice. The learning must be stamped in by action and generalized, and no amount of discriminating thinking about the game will compensate for failure to practice it. The reflective process merely sits monitor over this more fundamental organic process to remove hindrances. To see how an act ought



to be performed, therefore, and to have the motor judgment to do it are far from equal accomplishments.

But the technic of the organic judgment is not limited to motor adaptation. It is the ground plan which remains the norm of safe thinking. The intellectual judgment is winged, and it is therefore quicker. It often takes the short road. It is especially useful in meeting new situations or in adapting to a dynamic environment. Elsewhere the organic judgment is surer, if slower, and all thinking at last has to be corrected to it. The intellect provides a sort of 'first aid' adaptation which ripened experience supplements. The common sense of mankind has registered this truth in the value it has always laid upon the reliability of 'learning by experience.' Not only so but in the highest intellectual achievement it is not safe to get too far afield from this method of learning. In fact it may well be urged that the inductive method is as safe and as fruitful as it is, because the more rigorously it is followed, the nearer the technic of the process approaches that of the organic judgment.

#### SUMMARY

##### I. Lower animal learning

1. Organic fixation
2. Organic spacial adaptation
3. Organic choice

##### II. Higher animal learning

1. Organic association
2. Organic conception
3. Organic judgment

Lower types of learning function also with the higher on the upper levels of animal learning and account for some of the unusual learning which appears convincingly intellectual at first. This is shown in learning by what Mr. Hobhouse calls 'articulate ideas' and 'inference from experience.' All learning however seems to accommodate itself to explanation under one of these types or the integration of these types.

Throughout the entire field of learning covered by these six types, there are found three constants:

- (a) Repetition of stimuli and response
- (b) Synthetic assimilation of effects
- (c) Projection of integrated result of (a) and (b) in behavior.

These three represent therefore very inclusive generalizations upon the learning process. The first two (a) and (b), which represent the process which lays down the structure of learned behavior, show a striking similarity to Osborn's 'action, reaction, and interaction,' which he asserts represent major generalizations upon the process which lays structure in organic evolution.

## A POET'S PORTRAYAL OF EMOTION

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To the scientist, human emotion is a realm for study; to the artist, it is a field of operations: meanwhile each is somewhat hampered by an incomplete understanding of the other. The illustrations whereby psychologists illumine their deductions are marked by a certain lack of scope and distinctiveness. The pictures skilfully drawn by poets and novelists sometimes fail to convey their full meaning because that meaning was less clear in the painter's mind than was the dramatic value of the scene.

It is not to be supposed, of course, that a mutual encroachment on each other's territory would be profitable. There is one glory of science and another glory of art, and neither is to be enhanced by borrowing a halo from the other. But an excursion by each side into the preserves of its neighbor merely for the sake of seeing a large object from a different point of view could not be otherwise than doubly advantageous.

It happens fortunately that a philosophically inclined poet has staked out his claim, and with an ample circumference, on the borderland of the two empires, so that he is easily accessible from either approach. Robert Browning has by no means a monopoly on the recording of emotion, but in range, variety, and complexity of the record, supplemented by a crystallized perception of its significance, he has no rival. Moreover, he has realized the psychologist's own problem. In his 'Charles Avison,' one of the 'Parleys,' he says:

Now could we shoot  
Liquidity into a mould,—some way  
Arrest Soul's evanescent moods, . . .

and adds,

To match and mate  
Feeling with knowledge,—make as manifest,  
Soul's work as Mind's work, turbulence as rest,  
Hates, loves, joys, woes, hopes, fears, that rise and sink  
Ceaselessly, passion's transient flit and wink, . . .  
. . . to strike all this life dead,  
Run mercury into a mould like lead,  
And henceforth have the plain result to show—  
How we Feel, hard and fast as what we Know—  
This were the prize and is the puzzle!

In a letter to Ruskin he states his conviction that 'all poetry is the problem of putting the infinite into the finite.' And in 'Two in the Campagna' he acknowledges the difficulty of doing it:

Only I discern  
Infinite passion, and the pain  
Of finite hearts that yearn.

But in spite of its baffling elusiveness, emotion is the element in human life and character that Browning most delighted to honor. Added to his natural instincts as an artist were those qualities of his own temperament that encouraged his zeal and sharpened his understanding in this matter,—his fondness for subtle and poignant reactions, for the crests and crises of existence, for color, noise, and the thrill of motion, for conflict and its decisive terminus, for aspiration, accomplishment, defiance, his zest in waking people up, his catholic taste in disposition and situation. It is because of these very things that he 'writes with fury, but does not correct with phlegm,' as one of his critics complains, that he 'writes like a lion devouring an antelope,' as another puts it, and that he made still another feel as if he 'had been taking a bath among electric eels.'

In order to give point and definiteness to this analysis of Browning's treatment of emotion, I have selected some typical examples to be considered from two angles; first, the 'tensional' explanation of this experience, and second, its ethical aspect.

To the psychologist an emotion is an alert, heightened, but evanescent state of consciousness, involving some clash

between conflicting stimuli. The possession of 'mingled emotions' is therefore not an occasional phenomenon but the inevitable thing. Envy would not be envy without its sting of shame. As soon as a joy ceases to be a fearful joy it subsides into a mood of content. Desire takes its edge from anxiety. Grief is kept alive by the refusal to accept disappointment or bereavement as complete and final; such acceptance induces sodden resignation or sullen despair, unless the sorrow is transmuted into cheerfulness through a new channel of hope, or the anodyne of activity.

Conflict, however, means the dominance of one constituent, even if the ascendancy is only temporary. The drawn-battle stage cannot last long. An angry man, for instance, is a seething *mêlée* of scorn, rancor, disgust, jealousy. Presently one of these privates may assume command, and the angry man becomes a disgusted one; or the anger may be changed into remorse or triumph, as the case may be, through the dynamic outlet of striking a blow; or tranquillized into an amused contempt by the intellectual process of thinking it over.

The range of emotion is thus conditioned by consciousness, just as are the sensations of sound and sight. We count only a limited number of hues in the spectrum, not because the color-making apparatus is limited, but because we are. So if we can count only half a dozen or half a score of emotions, it is for a similar reason. Without pushing the metaphor too far, we may reckon as emotions those experiences which fall between the 'ultra-red' instincts, impressions, moods, and the 'ultra-violet' convictions and sentiments. Sometimes consciousness is literally destroyed, as in cases of swooning from excessive joy or fright, and sometimes it is converted into action.

Since some sort of a catalogue is necessary, I have chosen this middle register of the emotions as a basis for examination. My list, suggestive rather than exhaustive, includes the following: disgust, envy, fear, anger, grief, joy, pity, shame, and adoration. The number may be duplicated by recognizing the intensification of each one as a different emotion.

Thus disgust raised to the  $n$ th power becomes loathing; envy, a consuming jealousy; fear, horrified terror; anger, fury; grief, anguish; joy, ecstatic rapture; pity, poignant compassion; shame, humiliation; and adoration, worship. Four of our deepest and most universal feelings are omitted, being accounted as more permanent, stabilized sentiments. These are love, hate, pride, and hope. The real emotional opposite of shame is not pride, but a joyful exultation, and the direct contrast of fear is not hope, but a joyful relief. Curiosity, amazement, and amusement are intellectual reactions, tinged with emotion. None of these has escaped Browning's observation and portrayal.

#### DISGUST

The soliloquizing monk in 'The Spanish Cloister' and the duke in 'My Last Duchess' are commonly thought of as incarnations of hate and cruelty, and indeed they both confess to cherishing those amiable qualities. The pious votary says in so many words,

If hate killed men, Brother Lawrence,  
God's blood, would not mine kill you!

But in his case this chronic attitude was heated to the temperature of disgust by the intrusion of the despised though unconscious offender into his mood of lazy, smug satisfaction. The very sight of his pet aversion, tedious old fool that he was, pottering about in his garden was enough to raise the simmering spite of the onlooker to the boiling point, and cause his malicious, sarcastic envy, brewed by the ingrowing life of idleness and forced monotonous companionship, to froth over in a seething, unsavory loathing whose mumbled tirade would have scalded his 'heart's abhorrence,' had he been within reach. Withal, the necessity of dutiful response to the calls of religion adds the completing foil:

'St, there's Vespers! *Plena gratiâ*,  
*Ave, Virgo!* Gr-r-r- you swine!

The aristocratic, self-contained Duke of Ferrara, addressing with polished vivacity his guest, the envoy sent to arrange

the terms of marriage to the next duchess, would seem to have nothing in common with the vulgar, unrestrained monk. Yet his dominant emotion—disgust—is the same, and is given a different complexion by differences in source, constituents, and outcome. In him the consistent mood of scornful pride is keyed up into a reminiscent disgust by the situation, and that in turn is tempered by his artistic pre-occupations and his consciousness of connoisseurship in oils and bronze. He had once felt strongly enough to do what the monk wished vainly he might do, yet he did it with true patrician imperturbability. So now there is no effervescence in his emotion, partly because of its retrospective nature and partly because of a disposition that plumed itself on its haughty self-control. He is therefore able to diagnose his own case accurately:

Merely to say . . . Just this  
Or that in you disgusts me; here you miss  
Or there exceed the mark, . . .  
E'en there would be some stooping; and I choose  
Never to stoop.

It is the duke's fastidious contempt for carelessness, in contrast to the monk's careless contempt for fastidiousness, that allows his sneer to preserve its placid surface, and his vengeance to operate with a dispassionate inhuman effectiveness.

#### ENVY

Four of Browning's characters are actuated by envy. They all seem as poised and passive as the duke, yet three are like him driven to murder, and the fourth is obsessed by it in his last hour on earth.

The dainty Parisian dancer (in 'The Laboratory') who purchases poison with a kiss, and chats with the chemist while he fills the order, is as good an example as Medea of the diabolic fury of injured pride. Never are human passions so deadly in their warfare as when love is turning to hate. In this case the mood of hate was stimulated to an implacable jealousy by the vision of faithless lover and rival at the king's ball, but since it was finding an outlet in decisive action, it



could pretend to play. The little lady spices her rage with an interest in criminal chemistry and sweetens it with mocking laughter, though these really fan rather than smother the flame of her revenge.

The lover of Porphyria and the husband in 'A Forgiveness' are also casual in deeds of horror but the fatal decision was in both instances preceded by a period of conflict. Into the lover's mood of hopeless longing glides the sweet surprise of Porphyria's presence. Out of the struggle between the supreme bliss of the moment and the unendurable agony at the thought of its brevity comes the feeling of spiritual jealousy, as it were, and this leads to a way of capturing and keeping the fleeting perfection at which it seemed even God could not say a word.

The mood of the husband is a brooding suspicion that finally rankled itself into an overwhelming jealousy. When his destroyed faith had gathered enough force from repression and had conquered love and prudence, he became an Othello, a cool, esthetic, Browningsque sort of Othello.

The Bishop of St. Praxed (in 'The Bishop Orders his Tomb') is another connoisseur in art and as proud as Ferrara of his exquisite taste, but his pride is pricked into anxiety by the approach of death. Apparently the non-committal attitude of his 'nephews' toward his eager desire for a better tomb than old Gandolph's frets this anxiety, wavering between assurance and distrust, into a greedy envy that is soothed at the end into a gloating triumph, like the Duke's disgust, none the less keen for being aroused from remembrance of the past.

#### FEAR

Of all our emotions this is perhaps the most poignant and the most delicately poised. Our instinct to pit hope against it is acknowledged by the poet in his

Beat out thy last voluptuous beat  
Of hope and fear, my heart!

And again an immediate sequence is indicated in the exclamation,

No fear! Or if a fear be born  
This minute, it dies out in scorn.

The effect of conflict is expressed by the Threatening Tyrant ('Instans Tyrannus') when he admits that "The small turns great if it vexes you." Thus was his mood of annoyance intensified to exasperation by being baffled and frustrated, and this in turn to fear—"So, *I* was afraid"—by a new and unexpected sort of opposition. His account, however, is almost too detached to be called an emotion. The three most conspicuous examples of real fear are Caliban; the wife of Dmitri, in 'Ivan Ivanovitch'; and Count Guido Franceschini, villain of 'The Ring and the Book.'

Caliban, dabbling his feet in the cool slush of the cave and gazing out at sea and sky, indulging himself in theological speculations and a dare-devil intellectual analogy, is in a mood of complacent enjoyment. This is shattered and supplanted by fright through the bomb-shell of a sudden storm—to his superstitious soul a sure sign of divine wrath. In a confused welter of remorse, abject submission, trembling hope and potential gratitude, the cowed slave grovels and mutters,

Fool to gibe at Him!

Lo! 'Lieth flat and loveth Setebos!

'Maketh his teeth meet through his upper lip,

Will let those quails fly, will not eat this month

One little mess of whelks, so he may 'scape!

Quite similar is the mixture in the stricken heart of Dmitri's wife as she recounts the tragedy she has just lived through and tries to explain how and why, in a literal sense, she did live through and come home alone. Her experience is the most subtle of all. A simple innocent woman is subjected to the prospect of a terrific physical agony (named by the shrewd and cynical Adversary in *Job* as the severest test possible to make) which may be averted or at least postponed by the sacrifice of her four children to the attacking wolves. As she relates how her growing dread was sharpened into an anguish of despair, she becomes incoherent with grief, terror, apologetic self-justification, and trust in absolution, finally swooning under the strain.

Frenzied incoherence also is the climax of Count Guido's career, as the second of his two long speeches ends in a cry

of collapsing consciousness. Totally lacking in pity and a saving sense of shame, his controlling emotions up to the crisis had been envy, anger, and disgust, expressed in acts of deceit and a wanton, gratuitous cruelty. Brought to bay before the tribunal of justice, he simulates pride, hope, righteous indignation, as long as these have any chance of serving his ends. But finally, confronted with immediate, inexorable, and absolute doom, when his last pitiful card of confident incredulity had been played, and trumped by the dread document from the Vatican, he is wholly possessed by the fear that must inevitably triumph in the heart of the coward. His last nervous outpouring is the scream of the trapped animal:

Sirs, my first true word, all truth and no lie,  
Is—save me notwithstanding! Life is all!  
I was just stark mad—let the madman live  
Pressed by as many chains as you please pile!  
Don't open! Hold me from them! I am yours,  
I am the Grandduke's—no, I am the Pope's!  
Abate,—Cardinal,—Christ,—Maria,—God,—  
Pompilia, will you let them murder me?

After this, even without the guillotine, the rest would be silence.

#### ANGER

Of this emotion 'The Ring and the Book' also furnishes the most notable instance. After the first trial, Caponsacchi settles down at Civita in a mood of dreary resignation, which is fired into a passionate alarm and indignation by the tragic news that summons him back to the witness stand. No longer on the defensive, he turns the tables and assumes the rôle of accuser and judge, fusing his grief, tenderness, and infinite ruth for Pompilia, with his disgust at legal cynicism and its consequent incompetence and unpardonable failure, into a white heat of blasting, ironic scorn. The flame of his fury burns so brightly, sending out its little darts of bitter contempt, that it almost conceals the fuel it feeds on, fagots of compassion, despair, and adoration. It is only when the blaze dies down that we see their charred embers lying in the gray ashes:

Sirs, I am quiet again. You see, we are  
 So very pitiable, she and I,  
 Who had conceivably been otherwise.

Of a similar quality out of a totally different source is the anger of Ixion (in the poem of that name) whirling on his wheel. The struggle is between a prolonged physical torture that would welcome the relief of oblivion, and the mental torture that writhes under its sense of injustice and rejoices in its own vitality. He suffers but triumphs over his suffering by hurling at Jove his defiant imprecations and by wresting an ultimate hope from his present agony:

... from the tears and sweat and blood of his torment,  
 ... up let him look and rejoice!  
 What is the influence, high o'er Hell, that turns to a rapture  
 Pain—and despair's murk mist blends in a rainbow of hope?

Of a very different quality because lowered by personal spite and resentment is the anger of the unappreciated cavalier in 'A Serenade at the Villa.' His fever of self-pity, brought on by the conflict between spurned love and baffled rage, produces a symptom that Ruskin would deplore as a pathetic fallacy:

How the garden grudged me grass  
 Where I stood—the iron gate  
 Ground its teeth to let me pass.

#### GRIEF

This emotion comes in various textures according as it is woven from loss, bereavement, disaster, frustration of plans, and according as these are personal and selfish concerns or altruistic and compassionate. For an active lamenting grief Browning has little use, having nothing of the Jeremiah in either destiny or disposition. When he portrays regret it is usually in a satiric or at least homiletic vein, as in 'Pictor Ignotus,' 'Youth and Art,' 'The Statue and the Bust,' 'Too Late,' 'Martin Relph.' Even Andrea del Sarto, failure that he was, concluded that he regretted little and would change still less, an unashamed acknowledgment more approved than a weak apology. In dozens of poems we are told that 'it's better being glad than sad,' from 'Prospice,'

'Abt Vogler,' and 'Rabbi Ben Ezra' to the 'Epilogue to Asolando.' Nevertheless, on the other hand, we have the moods of pathos and wistfulness in 'Love among the Ruins,' 'A Toccata of Galuppi's,' 'Two in the Campagna,' and in the unanswered questionings of Cleon and Karshish.

The grief of Caponsacchi is swallowed up in anger, and Pompilia, in spite of her 'great, grave, grievful air,' fights her way through dismay, anguish, bewilderment, and despair, to hope and finally a gratitude—having the least to be grateful for—that absorbs all else.

The souls of Sebald and Ottima, (in 'Pippa Passes') the one swaying between remorse and a guilty acquiescence, the other still 'magnificent in sin,' are quickened to a belated shame and grief by the voice of Pippa, and these emotions are strong enough to effect a self-imposed retribution. The struggle of a base passion fighting its way to a high renunciation is signalized by the lover's cry that he was 'proud to feel such torments.'

### Joy

Browning is not unique in preferring joy to grief. Most of us are biased in the same direction. But depicting an emotion is quite a different matter from entertaining it, and it is often the joy of the artist to portray grief. The author of 'Strafford,' 'Luria,' 'The Return of the Druses,' has given sufficient evidence, in these and many another tragic picture, of his ability to understand and express the dust and ashes of life. Yet more perhaps than any other poet has he celebrated its nectar and roses. There are such lyrics of fulfillment as 'Meeting at Night,' 'Now,' 'Prospice.' There is exultation in swift motion and the sense of accomplishment in 'How We Brought the Good News,' and 'Pheidippides.' Even the dubious and dreary achievement of Childe Roland thrills through his horn in a blare of joyful triumph. There is the passionate patriotic fervor of Luigi (in 'Pippa Passes') and the passionate religious fervor of David (in 'Saul'), both winning through anxiety and troubled doubt to a self-absorbing bliss. The passing of an emotion into a mood,

as the stream into the sea, is fitly commemorated by Saul's young ministrant as he rides home next morning:

And the stars of night beat with emotion, and tingled and shot  
Out in fire the strong pain of pent knowledge; but I fainted not,  
For the hand still impelled me at once and supported, suppressed  
All the tumult, and quenched it with quiet, and holy behest,  
Till the rapture was shut in itself, and the earth sank to rest.

Two other examples of a conquering ecstasy are 'In a Balcony,' and 'In a Gondola.' In the first, Norbert's joy triumphs over bewilderment and anger, and Constance's over astonishment and remorse. In the second, the stolen happiness of the lovers is doubly radiant against the sinister background of impending peril and later its actual arrival. All of these confirm by experience Caliban's discovery that joy and grief both 'derive from weakness in some way.' Omnipotence is beyond both, and by the same token, deprived of both. Human impotence is balanced precariously between them and is kept awake by the necessity of preserving the balance. The merry mood, which is the breezy table-land of delight, is a favorite with Browning, and on it are assembled the students in 'Pippa Passes,' the mocking reader in 'Sibrandus,' the Italian Gentleman of Quality ('Up at a Villa'), Fra Lippo, Dominus Hyacinthus ('The Ring and the Book'), and others.

#### PITY

This emotion is of little interest to the robust herald of success and action, who would much rather admire and congratulate than commiserate and condone. He sometimes enlists a pitiful sympathy on the part of the reader, as for the young lovers in 'A Blot in the 'Scutcheon,' but for him pity is more akin to contempt than to love, and he will not permit us to pity anyone whom he really admires. He will not have us pity Pompilia, for instance, although it is a divine compassion that struggles in her warrior-priest with his suffocating sense of injustice.

The subject is worth a caption, however, for one instance, because in it Browning indicates his belief in its ethical im-

portance. The Persian philosopher in 'Ferishtah's Fancies' shows that pity is a justification of pain and a solution of the whole problem of evil. An example is cited wherein strong feelings of dislike, envy, resentment, are destroyed and then replaced by sorrow over the information that the enemy suffered from ulcer. The conclusion is thrown into the whimsical tone which mitigates much of the poet's didacticism.

Therefore, Mihrab Shah,  
Tax me my bread and salt twice over, claim  
Laila my daughter for thy sport,—go on!  
Slay my son's self, maintain thy poetry  
Beats mine,—thou meritest a dozen deaths!  
But—ulcer in the stomach,—ah, poor soul,  
Try a fig plaster: may it ease thy pangs!

#### SHAME

Shame is the opposite of pity in being the most inward of our emotions, as that is the most outward. We pity others; we are ashamed of ourselves. To pity ourselves is weak; to be ashamed of others is an unwarranted liberty, and indeed usually has a selfish source. What we are really ashamed of in others is the reflux of their disgrace upon us, and of ourselves in the last analysis for having such disgraceful connections. But the genuine personal humiliation that comes from a conviction of folly or failure is the most unendurable of all emotions, with the least compensation. Those who should be ashamed of themselves but are not are fair game for satire, and Browning does his duty in that direction with notable effectiveness. His subtle treatment of those who are put on the defensive by some challenge and made to retrieve their shame by self-vindication is most conspicuous in 'Bishop Blougram,' 'Prince Hohenstiel-Schwangau,' and 'Mr. Sludge, "the Medium."'

Shame may be compounded with fear, as in the half-sincere fanatic Djabal, (in 'The Return of the Druses'), or with grief and remorse over the injury done to others, as in Martin Relph, Sebald, and Dmitri's wife, or with anger, as in the Queen who took young Norval's declaration of love seriously, only to find it a strategic ruse. This poor



lady runs the whole gamut of emotion and is as perfect an instance as any of tension and conflict. No fury of a woman scorned could exceed this of a woman so humiliated, though no scorn or any disrespect was intended.

#### ADORATION

The noblest and most disinterested of our emotions, an element in love, loyalty, and worship, this feeling is diffused through literature as through life, but it is too rare for frequent crystallization. Moreover, expression of it is hampered by its very power. For when Browning himself, the supremely articulate, says, "I cannot praise, I love so much!" he loves with the high humility that adores in silence. Yet his lyrics abound in homage to the beloved, and his narratives in examples of devotion to leaders and causes.

In 'Strafford' we see Cavalier loyalty fighting a losing fight with disillusion, and adoration quenched in submission. The Algerian follower in 'Through the Metidja' has his thrill of worshipful allegiance spiced with a sense of danger. The wounded lad in 'Incident of the French Camp' who brings the message to Napoleon exults, adores, and dies as happy as all of Browning's dying youths. It is like Browning also, lover of animals, author of 'Donald' and 'Tray,' to embody the most perfect adoration in a man's love for his horse. The Arabian in 'Muleykeh' had saved his 'pearl' from the shame of defeat but had thereby lost her forever. She might have been rescued from the thief but at the price of being 'beaten in speed.' He is bereft, desolate, wretched, exultant, proud, for he had parted with his one surpassing treasure rather than abate an inch of her glory. In 'Count Gismond' adoration springs from gratitude; as it does in lighter vein in 'The Last Ride Together,' and of deeper quality in 'The Ring and the Book.'

These are some of the exhibits in Browning's wide picture-gallery. Since his genius was primarily dramatic, his portraits are characterized by individuality and objectivity. There are, however, a few sketches of himself by himself, extending from his first poem to his last, and constituting a testimony to the emotional strain in his own character.

In 'Pauline' he confesses frankly,

I am made up of an intensest life,  
Which would be all, have, see, know, taste, feel, all—  
This is myself.

At twenty the youth was ambitious to learn mankind,

Mankind, its cares, hopes, fears, its woes, and joys;  
and to attain to joy,

But one in life, so it were wholly mine,  
One rapture all my soul could fill:

at seventy-seven the young old man waved a gay adieu to life, and made his final utterance, in the 'Epilogue to Asolando,' a voicing of the glad and gallant feeling that had animated always his rich, profound living.

In another early poem ('Sordello'), and the very one that became a byword and jest for unintelligible obscurity, he announced as his poetic creed the simplest and most emotional possible:

Would you have your songs endure?  
Build on the human heart!

It is in that same 'incomprehensible' story that a character anticipates Fra Lippo Lippi in reading deep disclosures in surrounding faces,—“this stands for hope, that—fear.” And it is in another late poem, the Epilogue to 'Pacchiarotto,' that the poet exclaimed with no diminishing of fervor,

Mine be Man's thoughts, loves, hates!

Nothing is more characteristic of Browning than that his one magnificently sustained flight, 'The Ring and the Book,' should take the unique form of a dramatic monologue sequence, enclosed in parentheses, as it were (the first and last books), of personal revelation; and that these should reveal an emotional attitude toward the work itself, unparalleled in literary biography. The poet is avowedly, and incredibly, passionate over his miraculous discovery, the 'Old Yellow Book,' the 'ingot,' and equally so over the 'ring' he fashioned out of it. He displays to you with pride the repository of

pure crude fact,  
Secreted from man's life when hearts beat hard,  
And brains, high-blooded, ticked two centuries since,

and adds impulsively,

Give it me back! The thing's restorative  
I' the touch and sight.

When he turns 'its medicinable leaves,'

A spirit laughs and leaps through every limb,  
And lights my eye, and lifts me by the hair.

After this we hardly need telling that

I fused my live soul and that inert stuff,  
Before attempting smithcraft.

Nevertheless, despite these autobiographical glimpses, not forgetting either the tributes to Mrs. Browning in 'One Word More,' 'Prospice,' and 'O Lyric Love,' we do not require the explicit caution in 'House' and 'Shop' to tell us that essentially and deliberately his remained 'the unproffered soul.'

Perhaps it is as a corollary to this objectivity that we find a predilection for the individual as opposed to society or mankind. Browning had an avid interest in all sorts and conditions of men, and women, but few enlisted his affections, and certainly not the whole of them *en masse*. It is truly said, "The voice of a great community wakened no lyric note in him, nor did his anger on its behalf break into dithyrambs." With all his fervent love of music, 'the still sad music of humanity' never reached his ear or heart.

And it is undoubtedly this dramatic preoccupation that saved Browning, as it saved Dickens, from becoming submerged in the slough of dogmatism. For though he is the artist in portrayal, he is also the philosopher in interpretation. And through this he gives us his rationalized view of emotion.

It may be at first sight a disappointment to find the poet agreeing with the scientist as to the fleeting and distracted nature of our emotions. But this common premise is followed by a much more important conclusion, in which they also agree, that these same feelings, in all their strife and instability, are the stuff from which character is fashioned. Emotion is the raw material of character, and no matter how raw it may be, it is still material,—the thing without

which no product of any kind is possible. Our emotions may be as unstable as water, but they are as necessary as water to life and as transmutable into more permanent forms.

"The Moral Hygiene of Emotion," says Professor Dewey, "is to utilize emotional disturbances for the intensification of the intellectual life." "Suffering enters Browning's poetry," says Herford, "almost never as the artless wail of the helpless stricken thing. . . . It began to interest him when the wail passed into the fierceness of vindictive passion, or the outward calm of a self-subjugated spirit, or into speculative if bitter retrospect."

The sin of Duke Ferdinand and the Lady Riccardi (in 'The Statue and the Bust') was that they allowed their emotion to dry rot at ease, and consequently found their judgment day upon them unaware. The folly of Kate Brown and the sculptor Smith was that they rusted alive in a repression that gave neither romantic happiness nor artistic success. Far better for these and others 'to be dead of joy, James Lee,' than to lose both the joy and the potential value of the sorrow. 'Rabbi Ben Ezra' tells us that it is 'rage' that is 'right in the main,' and 'acquiescence' that is 'vain.' The crystallization of emotion into that sudden discovery of truth we call inspiration is portrayed directly through David in 'Saul,' and indirectly in 'The Last Ride Together,' 'Abt Vogler,' and Caponsacchi's experience in 'The Ring and the Book.' In these and other poems Browning exemplifies the advice of Lord Bacon that any painful destiny be 'not a dull and neglected suffering, but a wise and industrious.'

To Browning no emotion, not even love, is an end in itself but the means to the higher end of fine, dynamic living. Accordingly he has illustrated many times, particularly in 'Ferishtah's Fancies,' what Dewey calls 'the fallacy of Stoicism.' It is not the cold, unemotional nature that is the best type, but that of the strongest emotions kept under the firmest control. The whole problem of evil is solved by regarding pain as a stimulus to compassion for man, when he is smitten, and gratitude to God, when it is relieved. It

was a realization of the truth that feeling is not the antagonist of reason but its ally, that enabled Browning the poet and Meredith the novelist to lift their characters to emotional heights with no danger of toppling over into bathos, because supported by rationality on one hand and a sense of humor on the other.

By one poet then at least we are assured that any instinctive resentment we might feel at the pronouncement of the psychologists on our ephemeral and discordant emotions will be more than mollified by the knowledge of their ultimate ideal career. In the sentiments, convictions, and intelligent behavior into which they may be transformed we may find the harmony and permanence essential to our sense of the dignity and significance of human life.